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Realism in the Motion-Picture Drama

By FRANK PARKER STOCKBRIDGE

HANGING by one hand from the basket of a balloon several hundred feet above the earth, jumping from a moving aeroplane 3,000 ft. in the air with nothing between the actor and a frightful death but a slender rope, leaping overboard from a sinking ship—these are a few of the thrilling "stunts" which motion-picture actors have lately been doing, and which more are being trained to do.

Photo by Topical

A Motion-Picture Actor Hanging from a Balloon Rehearsing for an Aerial Drama

An English "movie" company seek-

ing for new thrills, hit upon the idea of building film dramas about the balloon and the aeroplane. Nothing short of genuine balloons, real aeroplanes, and actual adventures in mid-air would answer their purpose. The balloons and aeroplanes were easy enough to get—the hard part was training the actors and actresses for their parts. It is one thing to go up in a balloon, and something quite different again to leap from an aeroplane and catch a rope dangling from a balloon. And then to take a motion picture of this performance complicates the problem immensely. But all of these difficulties were overcome successfully and the balloon and the aeroplane are now numbered among the "properties" of the film drama.

How the Heroine of "Through the Clouds" was Saved from a 3,000-Ft. Fall

The training of actors and actresses for the production of film dramas in mid-air is carried on at Hendon, England, where a number of captive balloons are employed for the preliminary instruction. The first training consists in climbing a rope suspended from a height, perhaps from the gable of a house. When the performer has become proficient in this, he or she is then trained to climb the guide rope of a balloon that has just been started up. At a height of 200 ft. in the air they begin to climb and then practice hanging on to the basket in various attitudes. After a month of this training, those who are thoroughly qualified for the work are so proficient that they can climb a rope or hang from a balloon at any height with perfect confidence. So far no serious accident has occurred to any of them.

In the production of the film drama "Through the Clouds," however, the 17-year-old actress who played the principal rôle, nearly lost her hold on the rope when the balloon was 3,000 ft. above the earth, and was only saved by the quickness of wit and presence of mind of one of the actors who was not supposed to be visible in that particular scene. As a result, the drama had to be rewritten to fit the scene as it was actually photographed.

The theme of the play is the attempt of a courageous young girl to rescue her father from a band of criminals, who have captured him and are endeavoring to force him by torture to reveal the hiding place of his wealth. Hotly pressed by their pursuers the criminals drag their victim into the basket of a captive balloon which happens to be anchored conveniently near their line of flight, cut the anchor rope and fly away with him. But his brave daughter is not to be foiled so easily. Her plight and her youthful beauty appeal to a daring young airman, who volunteers to take her in his aeroplane in pursuit of the fleeing balloon.

In the staging of this play two balloons were used, lashed together, and in the basket of one the motion-picture camera man placed his machine. The field of his camera lens thus took in the lower part and the basket of the other balloon, and the aeroplane as it came close below. As originally planned, the girl was first to shoot the villain as he peeked over the edge of the basket to watch the approaching aeroplane, and then climb the rope into

the car of the balloon, where she would release her father from the bonds with which he was tied.

The whole action had to be carried on actually in mid-air. The balloons had to be high enough above the ground so that no buildings or trees would appear in the picture in such a way as to lessen the thrill, while, of course, an aeroplane is much safer at a considerable height than it is close to the earth. The first part of the action went off according to program. After three hours of maneuvering, the airman, one of the most skillful professional fliers in England, brought his machine to a point where the guide rope of the balloon trailed across the aeroplane. The young actress seized the rope and in another second was hanging by her bare hands, 50 ft. below the basket and half a mile above the earth. Hand over hand she climbed up the rope, a feat which she had successfully performed many times at lower altitudes, in rehearsals. The nervous strain of her first trip in an aeroplane, and the knowledge that a fall meant certain death, however, nearly cost her her life. Her hands were slipping on the rope when the quick wit of the actor who played the part of her father came to her rescue. Leaning over the edge of the basket he threw a noose of rope down around her body, hauled it tight, and in this way lifted her, her hands torn and bleeding and her strength almost gone, into the car. Then the drama had to be reconstructed to make it clear that after the villain had been shot the father had succeeded in untying the rope that bound him just in time to save his daughter from a horrible fall.

Photo by Topical **A Scene in the Aerial Drama That Had to be Rewritten: the Heroine Releasing Her Father**

More than a month of preliminary rehearsals, including balloon ascensions as high as two miles and lasting 10 hours, were required before the performance of "Through the Clouds" was finally photographed for the movies. Even more expensive rehearsals, however, and almost equal-

ly dangerous feats on the part of the performers were required in the production of the dramatization of Gerhardt Hauptmann's novel "Atlantis." The big scene in this is the sinking of a ship at sea after a collision with another vessel. The Danish company which reproduced this drama chartered a transatlantic liner, the "C. F. Tietgen," of 8,137 tons. Five hundred actors and actresses were placed on board to represent the passengers, while the actual officers and crew of the "Tietgen" acted in their regular capacities. The scenes of panic, lowering of lifeboats, frightened passengers leaping overboard—everything but the actual sinking of the ship—were enacted and photographed on board the "Tietgen" in the Kattegat, an arm of the North Sea. Then the ship went back to its dock, and another ship, which was externally an exact duplicate of the "Tietgen," but constructed of wood especially for the purpose, was towed out, and from another vessel, photographs were made showing the lifeboats taking to the water, passengers leaping into the sea, and all of the scenes and horrors which surround a genuine shipwreck, up to and including the actual sinking of the ship. It was realized by the producers of this film that photographs taken on the deck of the ship, while possibly thrilling, would not be entirely convincing unless an actual sinking ship were shown, and so many thousands of dollars were spent in building the dummy vessel solely for the purpose of sinking it after a few minutes of use before the camera.

No better examples of the actual reality of the events portrayed on the screen in a modern picture show could be given than these. Time was when the "movies" attempted nothing more than to show stage effects produced by the familiar mechanics of the ordinary drama. But the motion-picture audiences of today are quick to detect the difference between a genuine scene and one that has been faked. They demand realities for their nickels and dimes. Recognizing this demand, the producers of motion-picture films are leaving mere illusions to the old-fashioned "legitimate" drama, and are spending thousands and tens of thousands of dollars to give their patrons the real thing. If the action of the motion-picture drama deals with a shipwreck, a ship is wrecked for the purpose. If it demands that the heroine shall be rescued from a burning hotel, a hotel is burned in order that there can be no suspicion of fraud or deception when the films are thrown upon the screen. When the scene is laid in an old Spanish mission, for instance, the film producer is no longer content to have his stage carpenter build an imitation mission building, but moves his entire company and his camera men to southern California, and buys or leases a genuine old Spanish mission for dramatic purposes. Historic events are staged on the very spots where they occurred, with costumes and equipment reproduced with exact fidelity from those actually employed at the time. No historical structure is safe from the assaults of the moving-picture man. Recently an English company reproduced a film drama of the Middle Ages, the scenes of which were laid in and about the historic Tower of London, and the British government authorities were prevailed upon to permit the use of the actual tower for the occasion. When Sir Walter Scott's great romantic novel "Ivanhoe" was dramatized for the movies, one of the greatest peers of England lent his ancient castle for the staging of the famous siege scene, in which Front de Boeuf and Brian de Bois-Guilbert led their armored Norman host, with battle-ax and crossbow, to the assault of the stronghold which Ivanhoe and his archers were defending.

Not only in dramatic "thrillers" but in the representation of actual events realism is the rule in the motion-picture world. Explosions and railroad wrecks staged for the "movie" today must be genuine explosions and actual wrecks. No one has yet found a way to reproduce for the movies the scenes of such catastrophes as the Omaha

Sinking an 8,000-Ton Ship to Make a Thriller for the Movies

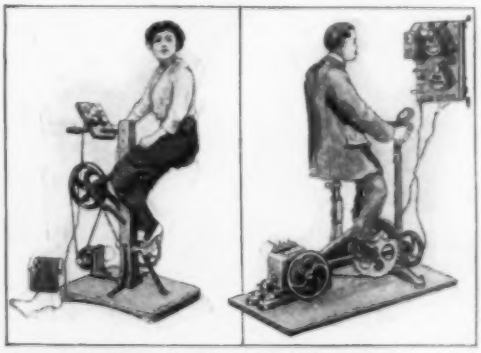
Courtesy of the Daily Mirror

Realistic Motion-Picture Drama in Which the Actors Actually Jump into the Sea

tornado or the Dayton flood by any sort of stage effect, but beyond a doubt the realism of the movies will eventually include such scenes as these. Today tropical scenes are actually staged in the tropics, while the motion pictures taken by members of Captain Scott's Antarctic expedition are giving the people of the whole world new and exact information about the strange and interesting scenes of the life of the polar regions. Recently one of the pioneer film concerns sent a man to South Africa with instructions to travel the entire length of the Dark Continent, from the Cape to Cairo, and make motion-picture films of every phase of African life and scenery, including the native tribes and the beasts of the jungle, while other operators are penetrating into almost every other strange or unexplored corner of the globe risking their lives in the effort to bring the whole world to the patrons of the movies.

NEW FRENCH EXERCISING MACHINES

Two ingenious exercising machines, both of which are operated after the manner of a bicycle and bring the same muscles into play, have recently been brought out in France. One of these combines exercise with utility, while the other is designed to oppose a definite and uniform resistance to the action of the muscles. In the first machine the flywheel is connected with a small dynamo, so that the user, while getting good exercise out of it, is at



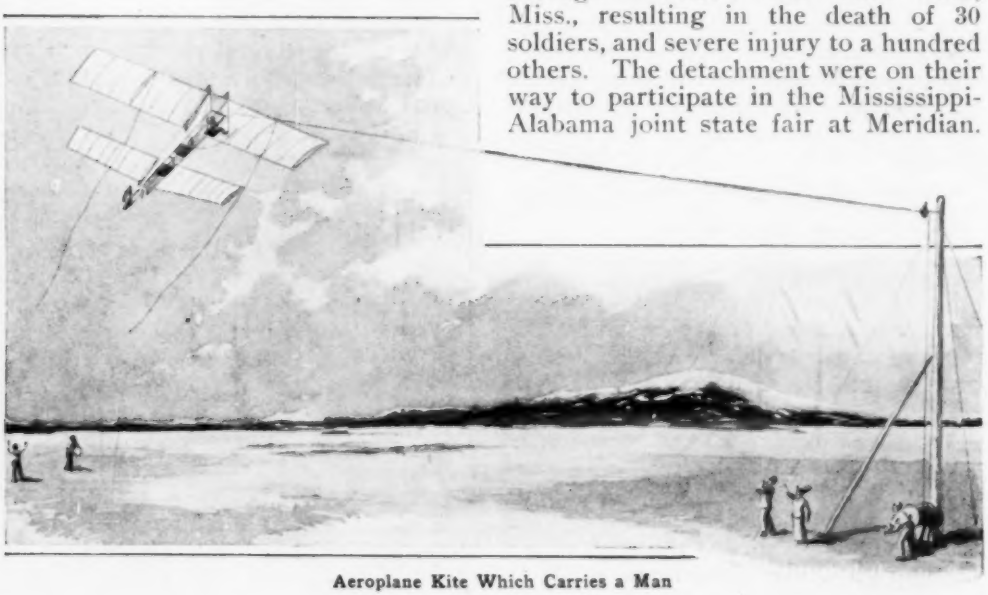
Exercising Machine That Also Stores Up Electrical Energy for Household Jse

With This Machine the Resistance is Adjusted to Suit the User's Health

the same time storing up electrical energy in a storage battery, which can be used for lighting or other domestic purposes. This machine comes in two types, one having a battery of 12 volts and 12 amperes, and the other, designed for stronger persons, having a battery of 12 volts and 25 amperes. It takes about an hour to charge the battery, which is capable of operating small metallic-filament lamps. By means of a dynamometer connected to the second machine, the exact resistance that is advisable in view of the condition of the muscles and state of health of the user, may be determined, and this machine is to be used for graduated exercise under the instructions of a physician. This machine is also supplied with measuring instruments which record the rate of revolution of the pedals and give full data as to the amount of energy expended by the user.

LARGE MAN-CARRYING KITE FLIES STEADILY

An Illinois man has built an aeroplane kite, 30 ft. wide, 20 ft. long, and weighing 70 lb. In a 10-mile breeze, the kite flies steadily, but it requires a 20-mile wind to enable it to carry a man. The main wings, constructed of a strong, but light cloth, supported by 1-in. spruce pieces, are set at an angle of 20 deg. The small wings are tapering, and the kite rises on a ¼-in. rope to the height of 1,000 ft. The kite raises itself without aid in a fair breeze. The two ropes seen dangling from the main wings are of use in starting and landing.



Aeroplane Kite Which Carries a Man

AUTOMOBILE PRODUCTION AT DETROIT

About 400,000 automobiles are turned out each year by factories located at Detroit, Mich., while the total value of automobiles and automobile supplies produced annually in that city amounts to over $650,000,000. These factories give employment to 120,000 men and have a weekly pay roll of over $1,500,000.

SOLDIERS DIE IN WRECK AS BRIDGE FALLS

A train bearing two companies of United States Coast Artillery crashed through a trestle near State Line, Miss., resulting in the death of 30 soldiers, and severe injury to a hundred others. The detachment were on their way to participate in the Mississippi-Alabama joint state fair at Meridian.

Photo by Underwood & Underwood
Searching for the Wounded in Wreck of Train Bearing Soldiers from Fort Morgan

The wreck was caused by the tender jumping the track when about 200 ft. from the trestle. It broke loose from the engine and, with the baggage car and three coaches, plunged 25 ft. to the ground. Entangled in a twisted mass of wreckage, the task of rescue was slow, and while the tragedy was spared the climax of a fire, the large number of wounded, pinned under the broken cars, made the casualty appalling.

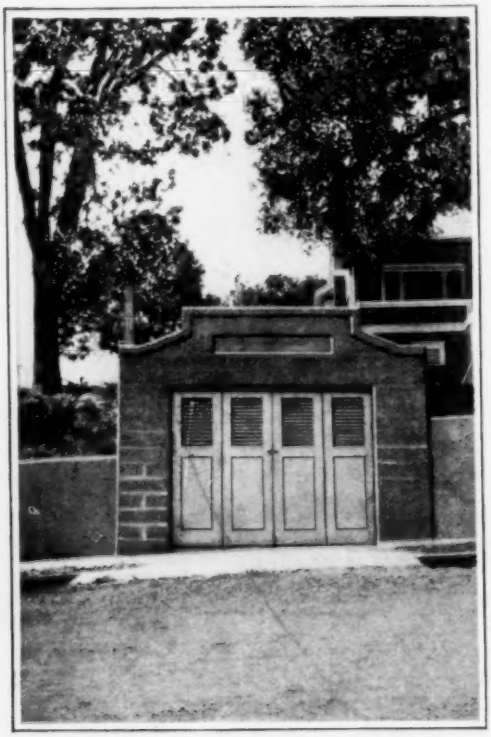
ANOTHER "SMALLEST STORE" ATTRACTS TRADE

A "beauty parlor," only 4½ ft. wide and 22½ ft. long, attracts a steady stream of customers in a western city, and every available foot of space is utilized to the fullest extent. While undeniably tiny, careful arrangement of chairs, tables, and utensils afford accommodations for two operators and several customers. Everything is as neat as a pin, and with good light and excellent ventilation, the little shop is paying well.

Tiny Shop Does Big Business

SIDE-HILL GARAGE SET IN FRONT LAWN

To save driving his automobile up a steep incline to the level of his lawn, a motorist who lives on a hill in



Dug-Out Garage Built in Embankment in Front of Motorist's House

Sebastopol, Cal., has built his garage in the embankment in front of his house so that he drives in on street level. With a facade built of rough concrete blocks and the lawn carried over its roof, the garage is convenient without detracting from the beauty of the street. Steel doors are used as a safeguard against fire.

POMMERY PRIZE REAWARDED BY FRENCH AERIAL LEAGUE

The Pommery prize for the longest aeroplane flight between sunrise and sunset has now been awarded to Brindejonc-des-Moulinais, the French airman whose feat in flying from Paris to Warsaw, a distance of 933 miles, was described in the August, 1913, issue of Popular Mechanics Magazine. Some time later another French airman, Guillaux, started from Biarritz and claimed to have landed in Brockel, a small village near Bremen, thus surpassing Brindejonc's record by a few miles. He produced a certificate, apparently signed by the burgomaster of that place, on the strength of which he was awarded the Pommery prize. It was soon discovered, however, that he did not land in Brockel, but in Brackel, a village some 60 miles nearer his starting place, and that the "a" had been changed to an "o" in his certificate. The aeronautical commission of the French Aerial League not only canceled the award of the Pommery prize to Guillaux, but suspended his pilot's certificate for 10 years, and made the award to Brindejonc. The incident created a great sensation in Europe.

GOVERNMENT TO USE ARABIC NUMERALS ON BUILDINGS

The treasury department has issued orders to its architects to the effect that the date of erection of United States government buildings shall hereafter be marked in Arabic numerals instead of Roman. Some difficulty has been experienced in deciphering the date when the somewhat complicated Roman system has been used, and the adoption of the Arabic style is expected to remove this cause for complaint.

WIRELESS TOWER TALLEST STRUCTURE IN AMERICA

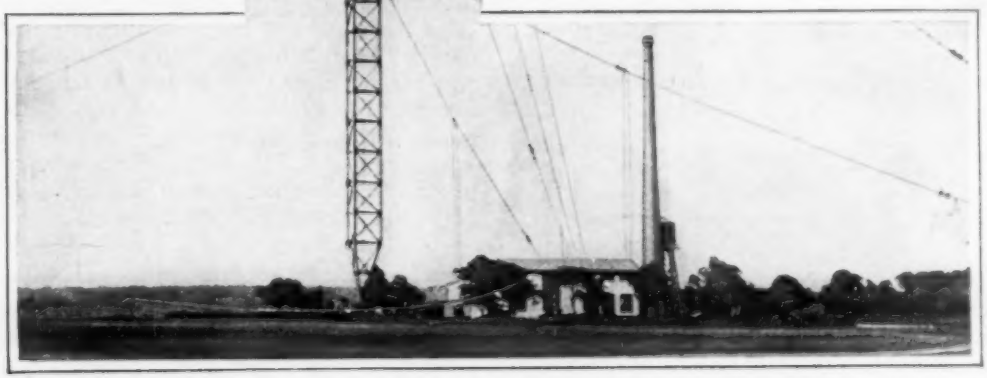
The highest structure in America, and, with one exception, the highest building of any kind in the world, has just been completed on the New Jersey coast. It is a wireless telegraph tower, 825 ft. high and only 20 ft. in diameter. So quietly has the work of building this tower been carried on, and so remote from ordinary routes of travel is its location, that it was practically completed before anyone except the builders themselves realized that

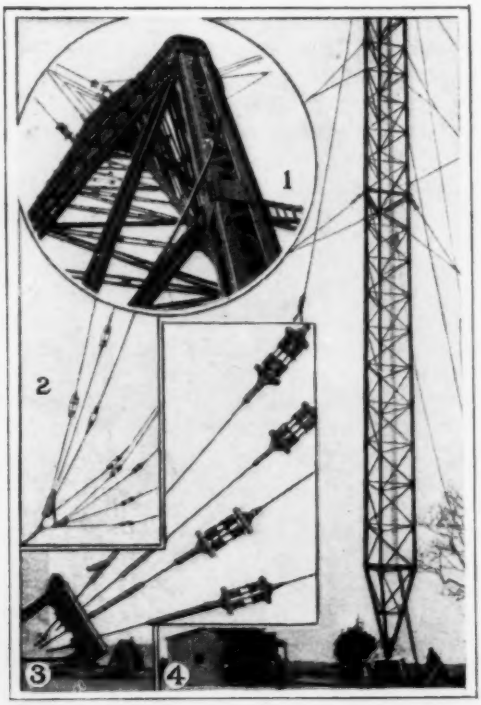
there was being erected in America a structure which tops the great Woolworth building in New York by 75 ft. and lacks 160 ft. of being as high as the famous Eiffel tower of Paris, which is still the tallest monument to man's engineering ability and ingenuity.

This new wireless tower, which rises from the tidal meadows near Tuckerton, N. J., was built by a German company which is using the new Goldschmidt high-frequency system of wireless. All the material used in its construction was brought from Germany, and German workmen and engineers were imported to erect it. The tower is unusual and remarkable in many ways. It is made of structural steel, well cross-braced for stiffness. The lower end is pointed, like a huge lead pencil, and terminates in a 15-in. ball of solid cast steel, which rests in a cast-steel socket on a base of structural steel girders.

These girders in their turn rest, for insulation, on six huge columns of glass, each 2 ft. in diameter, and these are supported by a solid concrete foundation which is sunk far into the ground. Braces weighing a ton each are used to hold the steel base in position on the glass supports, which are used for insulating purposes, to prevent the grounding of the powerful high-tension electric current.

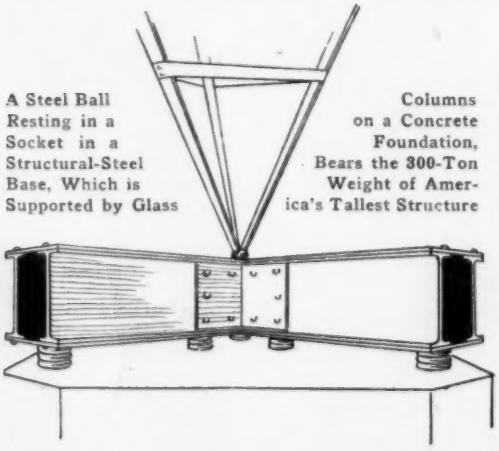
The tower itself is triangular, 20 ft. across on each side, up to a height of 480 ft., where it comes to a point. Balanced on this point is the pointed lower end of the triangular upper section, 345 ft. high and 16 ft. on each side. This method of construction, avoiding the use of rigid joints between sections of the tower and between the tower and its base, was adopted to prevent earth vibrations from affecting the structure and possibly interfering with the wireless waves. Arms projecting upward from the lower section of the tower prevent the upper part from slipping from its socket, without holding it rigidly. Sufficient rigidity of the entire structure is obtained by means of wire cable guys. There are 12 of these great cables, six of 3 in. diameter and six of 2½ in. They are attached in threes at four different points about 200 ft. apart, and are carried to anchor-





Details of the Highest Tower in America: 1, Looking Up the Tower; 2, Wind Anchors to Keep the Main Cables from Swaying; 3, One of the Guy-Cable Anchorages, Showing an 1,800-Lb. Insulator; 4, How the 300-Ton Structure Rests on a Point

ages formed of three great concrete blocks, 560 ft. from the base of the tower, four cables to each anchorage. Each anchor contains 1,100 tons of concrete, and is sunk 30 ft. into the earth, while rising 20 ft. above it. On each cable are four insulators, weighing 1,800 lb. each, arranged in pairs. The anchor cables have themselves to be anchored by means of smaller cables and anchorages, to prevent swaying in heavy winds.


A Steel Ball Resting in a Socket in a Structural-Steel Base, Which is Supported by Glass
Columns on a Concrete Foundation, Bears the 300-Ton Weight of America's Tallest Structure

Running up one side of the tower is an ordinary steel ladder, with loops at intervals of 5 ft., through which a person ascending climbs, and by means of which he may rest during the ascent. One of the German workmen made the climb of 825 ft. in 20 minutes, stopping for his first rest of a minute or two at the height of 480 ft. Most of the workmen, however, took an hour for the ascent when the finishing touches were being put on the top of the tower.

The company which constructed this Tuckerton tower has built a similar one at Hanover, Germany, and messages direct from Hanover are now being received in New Jersey. The sending apparatus is expected to be installed in the American tower early in January. It is reported that the same company plans to erect another giant tower on the Pacific coast of the United States, others on various Pacific islands and the continent of Asia and so have a wireless circuit of the globe.

INCREASING USE OF THE METRIC SYSTEM

The fifth general conference on the metric system which opened at Paris Oct. 9, 1913, discussed the problem of internationalizing weights and measures. A dozen important countries have passed laws compelling the use of the metric system since the last conference, Denmark, China, Japan, the five republics of Central America, Bulgaria, Chile, Uruguay and Siam having fallen in line. The first British colony to adopt the metric system in its entirety is the island of Malta.

¶San Francisco is trying to produce asphalt pavements that will not be slippery when wet, by spreading coarse sand upon the asphalt while hot.

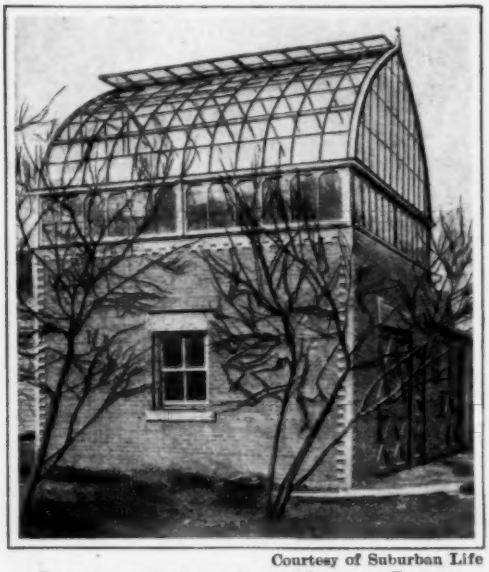
THE FIRST LIGHTHOUSE BUILT FOR AIRMEN

They who go up in the air in ships are to have their warning signals and their lighthouses no less than their mariner brothers. In Germany the first aerial lighthouse has been built, and electricians are experimenting with lights and mechanism to project beams of light upward and to the distant horizon so that air fleets may know their position no matter what dark hour they scout the heavens. The illustration shows the new lighthouse at Johannisthal, with the ill-fated "L 2" hovering over it. Fog, though very thick, almost impenetrable on the ground, thins so rapidly that, a hundred feet, or so, in the air, brilliant beams from high-power arc or acetylene lamps cut through to the upper air, giving aerial scouts their bearings. Stations will be identified as on the coast by differing lights—a straight beam, upright; a disappearing light, at intervals; another by signaling a number or code of dots and flashes to spell the name or number on the service map.

Courtesy of The Sphere

GREENHOUSE ON GARAGE PROVES PRACTICABLE

Heating his greenhouse, garage, and henhouse from one plant was found economical and satisfactory by one amateur gardener, and the idea has obvious merits. The greenhouse, besides having the decided advantage of plenty of light and air, is warm and easily heated. For the suburbanite, a greenhouse atop his garage might solve many problems. At least the daily study of flowers and growing things would be a welcome relief from the grind of business. Whether as fad or hobby, the private greenhouse should be encouraged, and this clever idea may well be copied.

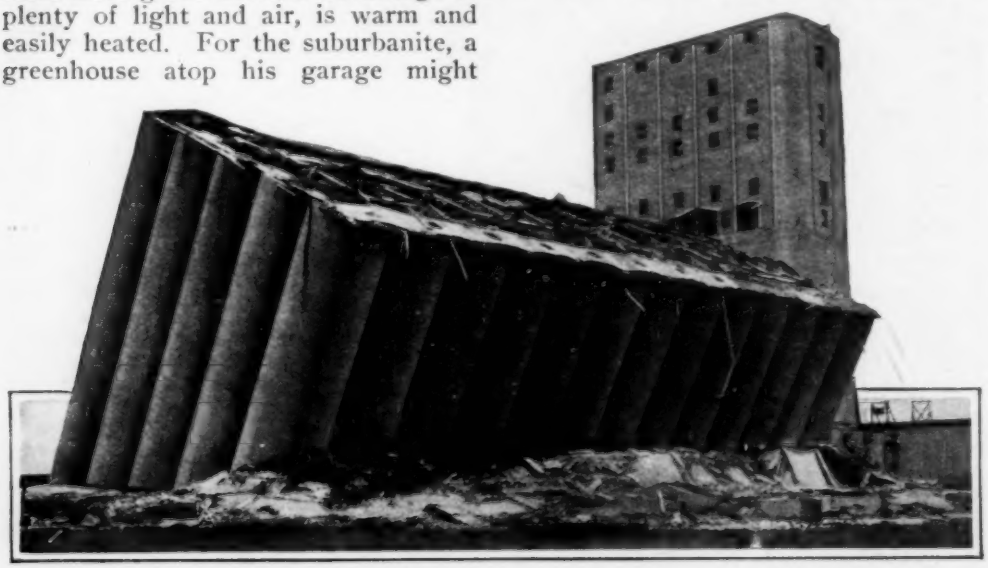


Courtesy of Suburban Life

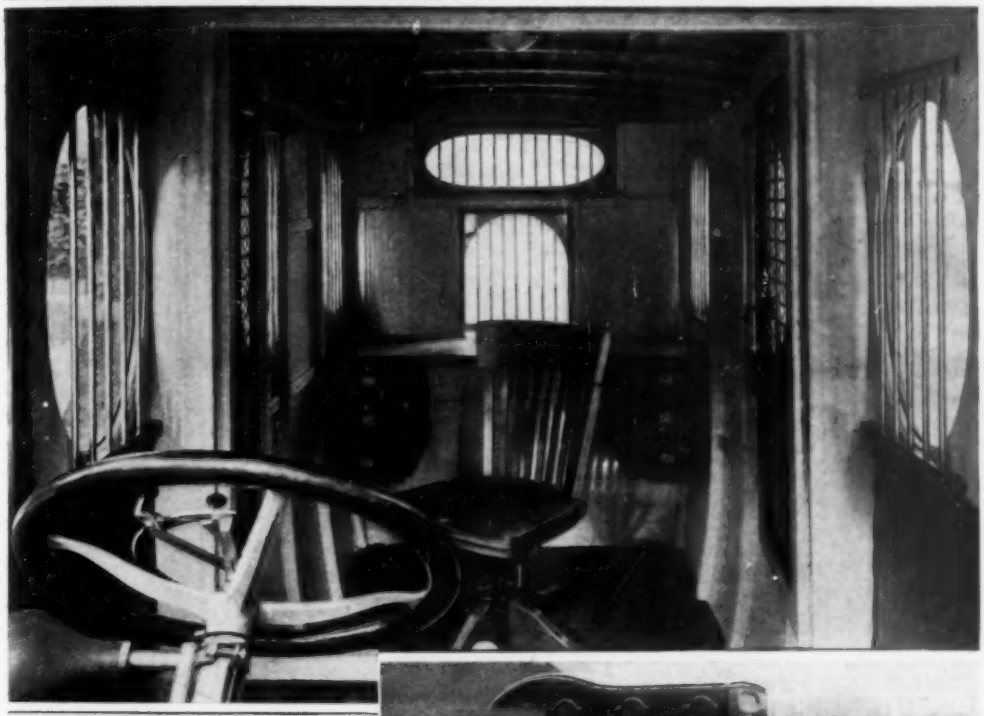
Greenhouse Built on Top of Garage a Feature of Indoor Gardening

CONCRETE ELEVATOR FAILS IN NOVEL WAY

An elevator accident of unusual character occurred at Winnipeg recently when a reinforced-concrete elevator consisting of 65 storage bins sank 20 ft. into the ground and tilted about 30 deg. out of plumb. With the exception of the cupola housing the distributing machinery, which toppled off the elevator and crashed to the ground, the structure was apparently uninjured. The movement was comparatively slow, about 1 ft. a minute at the greatest, and there was plenty of time for the employes to get out of the way of danger. The foundations were of the floating type, as are practically all foundations in Winnipeg where the underlying strata of soft clay are of such depth as to make the sinking of caissons virtually impossible, and the accident is attributed to



Big Concrete Elevator That Settled 30 Degrees Out of Plumb without Collapsing



Interior of Pay Car, Showing Strongly Barred Windows

Paying Off Laborers from City Pay Car

a flow of this soft material caused by an uneven loading on the elevator foundations. At the time of the accident the elevator was filled with grain. As soon as the movement had stopped holes were cut in the sides of the bins nearest the transfer house, chutes were installed connecting with the elevators in the transfer house, and by this means much of the grain was loaded into cars and removed to other elevators.

DETROIT'S NOVEL PAY CAR TO FOIL THIEVES

Having had some disagreeable experiences in losing money sent out to pay laborers, the city of Detroit, Michigan, has recently installed a pay car of novel design. It is an automobile, strongly built with inclosed body and barred windows. Two policemen guard the entrance, which is in front, and one of them acts as driver. The cashier sits in his swivel chair with all necessary books, pay rolls and pay envelopes conveniently arranged about him. A ledge beneath the window in the rear of the car affords an easy place to pay the men as they line up to receive their money.

¶ Since Gatun Lake is the only large body of fresh water in Panama it is expected that it will attract many birds on migratory journeys and become a permanent habitation for native birds and small animals of the isthmus, and it is suggested in official quarters that the Canal Zone be declared a game preserve.

LIFE GUARD FOR RAILWAY TRUCKS

From the report of the Interstate Commerce Commission it appears that most fatalities and injuries in steam-railway traffic result from being struck and run over by cars. A device has just been patented which seeks to prevent such accidents by means of a revolving wooden spool, hung on springs at each corner of the car truck above the rail. The spool is dished, and is yieldingly supported in such a position that an object, which might ordinarily be hit by and thrown under the wheels of the moving car, is struck by the dished spool and thrown to one side, out of harm's way.

RUBBER AUXILIARY ARMOR FOR SHIPS

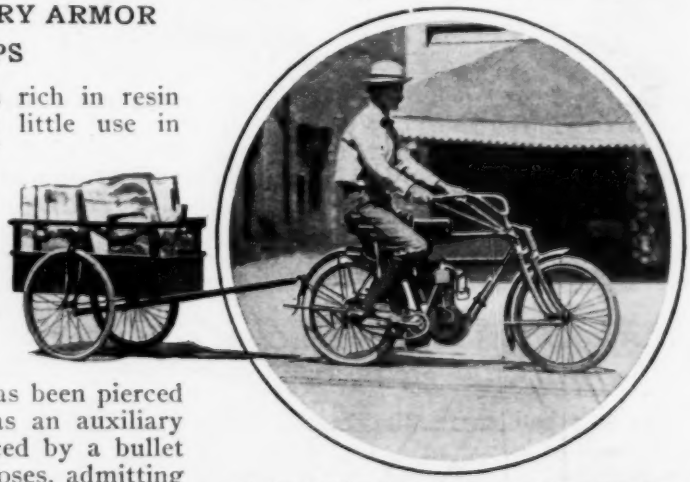
Certain rubber gums rich in resin have heretofore found little use in manufacture, as the refined product from them is of inferior quality. A German inventor has discovered that a product made from these gums is perfectly adapted to use in preventing leaks in vessels whose sheathing has been pierced by projectiles. Used as an auxiliary armor, the hole produced by a bullet or shell immediately closes, admitting little if any water, owing to the prompt action of the rubber, which acts as a typical organic colloid, that is, returns to its original form when divided by any force.

EARTHQUAKES FORM HOLE IN BOTTOM OF SEA

A hole nearly a mile deep was formed in the bottom of the sea off the coast of Panama by the recent Central American earthquakes, according to apparently authentic reports. As a result of these earthquakes a submarine cable was broken, and a cable ship was sent out to make repairs. The ends of the cable were found to be buried under enormous masses of material, and, where the government charts published in 1904 showed a depth of 1,000 ft., soundings made from the cable ship found a depth of 5,000 ft. This remarkable depression is located off Los Santos province, about 15 miles from the mainland, and is about half a mile wide.

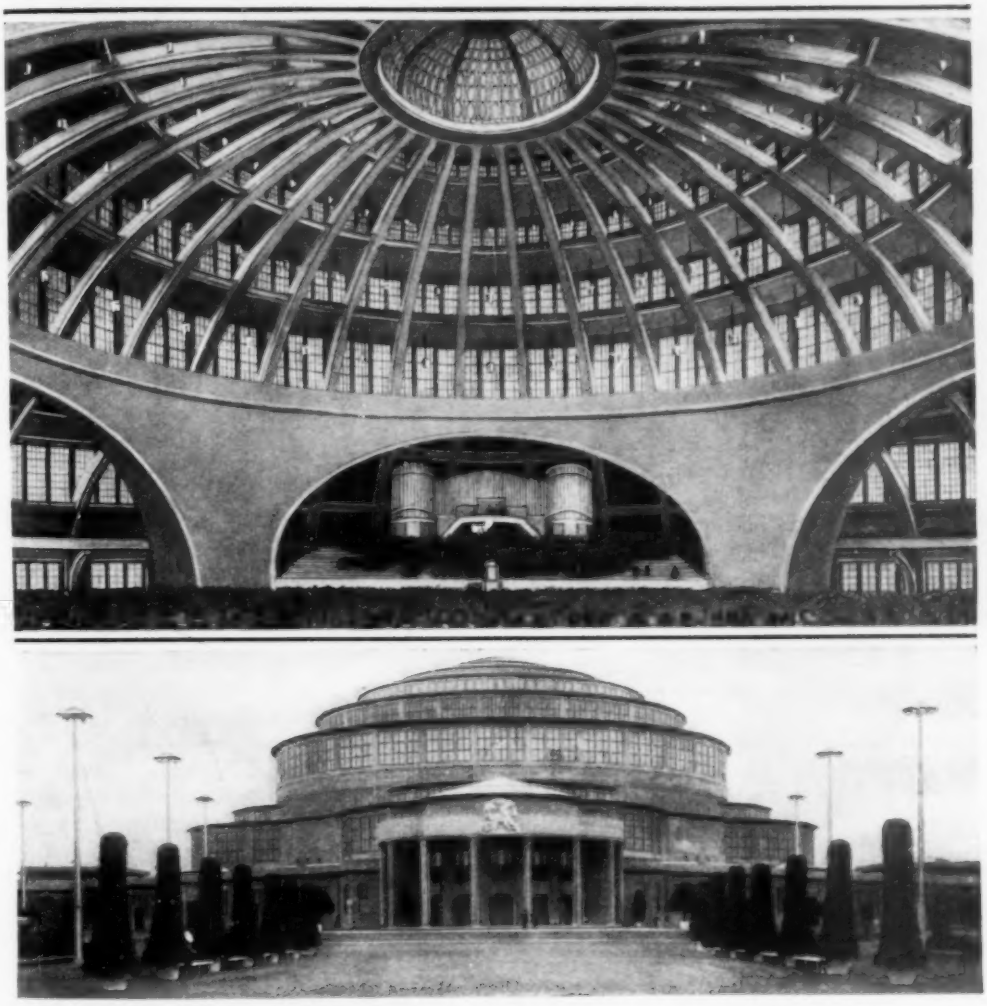
HANDY TRAILER FOR MOTORCYCLE

To expedite the delivery of parcel-post packages a California letter carrier has devised and built a trailer for his motorcycle. The little car, which is constructed on two bicycle wheels, will carry 250 lb. It is equipped with underslung springs, has a wire screen to keep packages from falling out, and a cover for wet weather. It may be attached or detached instantly.



Letter Carrier Uses Trailer to Deliver Parcels

GREAT CENTENARY HALL AT BRESLAU



Front of Massive Memorial Hall Erected for Centennial at Breslau and an Interior View Showing Great Organ

Celebrating the hundred years elapsed since the "War of Deliverance," the city of Breslau, Germany, has erected a magnificent festival hall of reinforced concrete, the dome of which has a greater span than that of the Pantheon. Situated in the most beautiful park of that ancient city, which is second only to Berlin in size, the Centenary Hall will house both an historical exhibition and an horticultural show of more than national import. One of the largest pipe organs in the world is installed, having five keyboards, 187 stops and 15,120 pipes. The organist must have intimate acquaintance with 1,700 combinations by means of levers, stops, push buttons, and other devices. Within the exhibition may be seen rare and beautiful articles displaying the craftsmanship of many continental countries. After the centenary celebration of the release of the city from occupation by the armies of Napoleon, in 1813, the hall will remain a monument to conjure up pa-

triotic pictures through succeeding generations. In construction it is massive throughout, rising to about 140 ft. at the apex of the dome, which has a span of 220 ft. The interior hall will have accommodations for about 10,000 people.

CURIOUS AQUEDUCT BRINGS WATER TO KYOTO

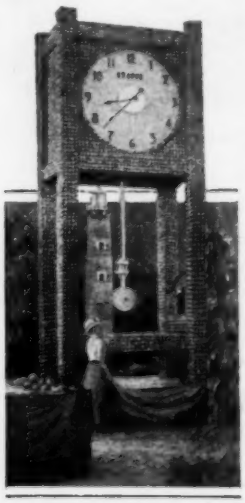
Straight through a mountain the water of Lake Biwa is brought to Kyoto so that Japanese may be well served. The source of supply is six miles from the city and the aqueduct is an example of skillful engineering. The tunnel through the mountain is perfectly straight, so that a person traveling through it may see the other end, a mere speck in the distance, as soon as he has passed the entrance. Small boats traverse the canal and the trip is an interesting one.

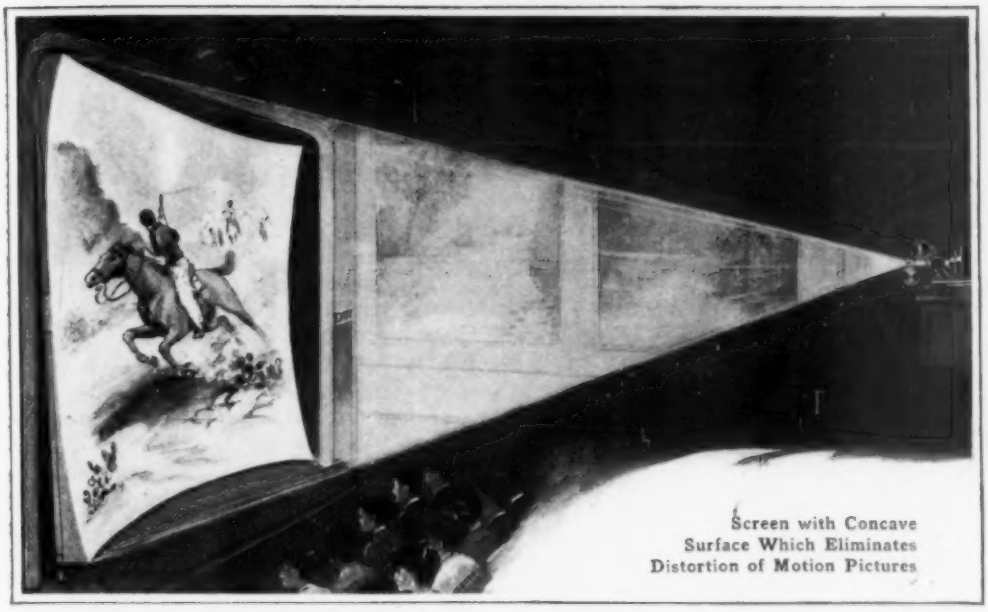
PLAN TO BUILD HIMALAYAN CABLEWAY

Plans have been perfected for one of the most remarkable transportation systems in the world, an aerial cableway about 75 miles long to connect the historical city of Kashmir with Abbottabad, a city in the Punjab plain of northern India. The line will run through the most rugged part of the Himalaya Mountains, where, owing to the nature of the country and the danger from earth slides, the construction and maintenance of a railway of any kind is practically impossible. The cableway will be constructed in spans of about 800 ft. with cables supported on steel towers, some of which will be 100 ft. or more in height. There will be two cables, one for ingoing and one for outgoing freight, and these will be spaced 9 ft. apart. The line will be divided into sections of five miles, each section having its own hauling cables operated by electric power, and devices will be installed at the end of each section for automatically transferring the cars to the hauling cable of the next section. Each car is designed to carry from 335 to 450 lb. of freight. The line will extend from hill to hill and in many places the cars will pass over great gorges, a quarter of a mile or more in depth. No attempt will be made to carry passengers at first, but if the cableway is found to work with perfect safety and no accidents occur after a year or two of operation, it is planned to put on equipment for carrying such passengers as care to try this mode of traveling. This will be by far the longest cableway in the world. It is estimated to cost about $1,500,000.

CLOCK MADE OF APPLES IS 30 FEET HIGH

Chiming out the hours at a recent apple show in California was a great mission clock, 30 ft. high, the framework of which was made of apples. Upon a solid timber foundation, varieties of apples were affixed, forming a covering. The face was made of dried apples, and even the pendulum was loaded with fruit. Other novel exhibits at the same fair and made from the same material were dirigible balloons and a lighthouse.





Screen with Concave Surface Which Eliminates Distortion of Motion Pictures

CONCAVE SCREEN FOR MOTION PICTURES

Eliminating false perspective and making every portion of the picture equally distant from the projecting light, a Chicago inventor has patented and placed on the market a concave screen for which much is claimed. The screen is a segment of a sphere, the lens of the projecting apparatus being at the focal point of the screen, and as a result all the rays of light strike the surface at the same angle, and are reflected to the spectators without distortion. Another virtue claimed for the concave screen is that it improves the acoustic properties of the hall, or theater, in which it is used. As sound waves are projected and reflected in the same manner, the concave screen reflects the music of the orchestra and songs to all parts of the theater, avoiding a very common fault.

¶ Lumbermen who take cedar and mahogany from the forests of Colombia are required to plant young trees of the same species in the cut-over spaces.

ARTISTIC SIGNBOARDS USED IN EUROPE

American sign painters and advertisers using outdoor publicity may find

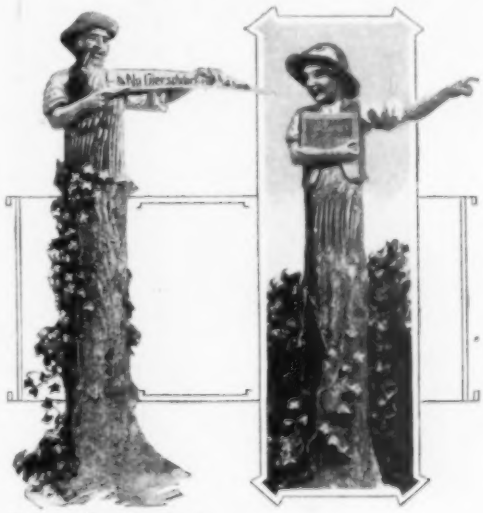


Photo by Paul Thompson

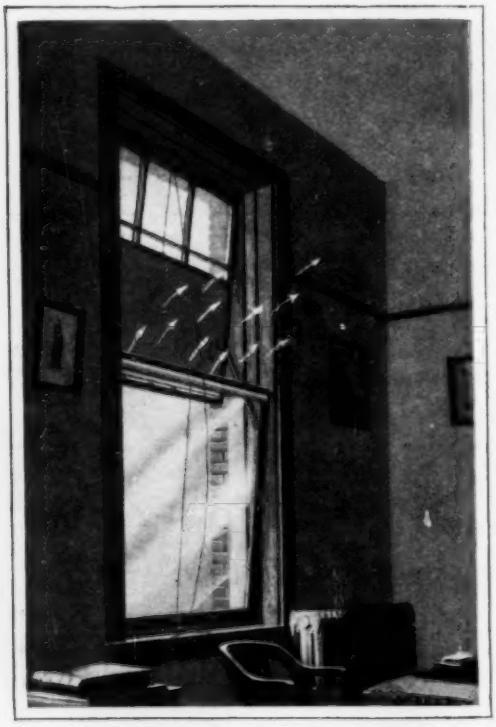
Carved Signposts on Silesian Highway

a lesson in the artistic signs along the public highways of Silesia. In one, a peasant, pipe in mouth, leaning on his scythe, gives direction and dis-

tance to the next town; in the other, a schoolboy, pointing, shows the way to the famous hot springs of Warmbrunn. Little objection could be urged against such signposts even by the most insistent advocates of billboard abolition.

NEW TYPE OF VENTILATING WINDOW

A tilting window frame of solid-steel construction permits full and free ventilation without drafts. The sash



A Self-Balancing Reversible Window

swings on pivots, is easily operated, and when slightly opened for ventilation purposes, may be left safely, as it will not allow rain or snow to enter, even when driven by a high wind. By continuing the operation of raising the bottom sash, the action of the balance arms pulls the sashes parallel with the frame to a vertical position and provides an opening, at top and bottom, of half the area of the window frame.

RECLAIMING A PROVINCE FROM THE SEA

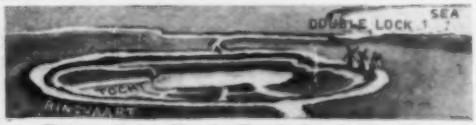
The Dutch nation is planning the conquest of that arm of the North Sea which penetrates the Netherlands for a distance of 80 miles, covering some 2,000 square miles of fertile soil with salt water. The Zuider Zee (Southern Sea) was formerly a salt marsh or lake, known to the Romans as the Flevo, and floods occurring in the thirteenth century gave it its present size, nearly 35 miles wide, but shallow, averaging only 10 to 19 ft. in depth.

In her speech from the throne at the recent opening of the Dutch Parliament, the Queen of the Netherlands stated that a bill would be introduced for the draining of the Southern Sea so as to form a new province. This project is the result of years of careful study and will doubtless be carried to successful consummation, although it is estimated that $90,000,000 must be expended before the end is reached. That the Dutch engineers have not underestimated the serious difficulties before them is evident from the fact that they have assigned from 33 to 36 years to the task, but as it is believed the revenue derived from the additional area will bring over $25,000,000 annually to the crown the thrifty Hollanders do not balk at the tremendous investment of time and money.

The Zuider Zee is partially separated from the North Sea by a chain of islands, Texel, Vlieland, Terschelling and Ameland. It is now a source of revenue, the Zuider Zee fisheries producing about $800,000 annually. But surveys have shown that the soil beneath the sea is nearly all sandy clay, therefore fertile land, capable of bearing, under the careful, intensive farming operations of Holland, heavy crops. And the produce of the small farms of the Netherlands per acre is relatively high.

The project contemplates a progressive attack, successive areas being brought under control by means of dikes and ditches, and a portion of the sea only, and that to be used as a fresh-

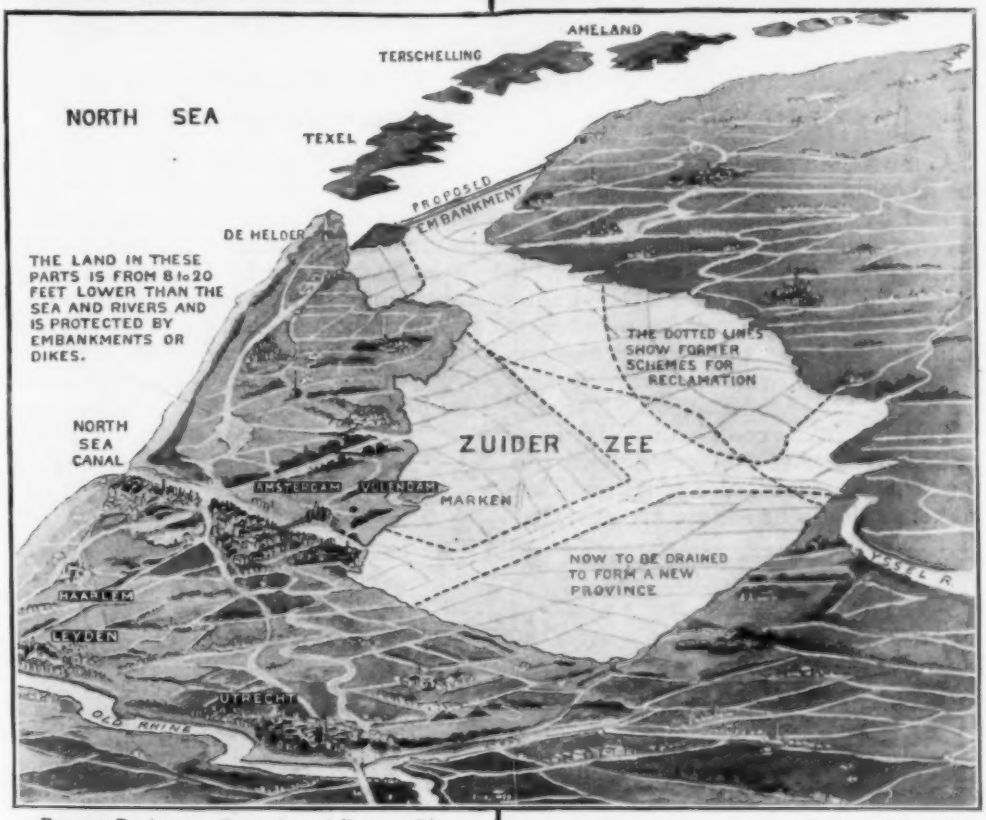
Water Pumped from Enclosed Lake into Canal



Former Lake Nearly Ready for Agriculture

Main Drainage Canals inside Old Lake

Difference in Water Levels between Canal and Sea



Present Project an Extension of Former Plans

Courtesy of the Sphere

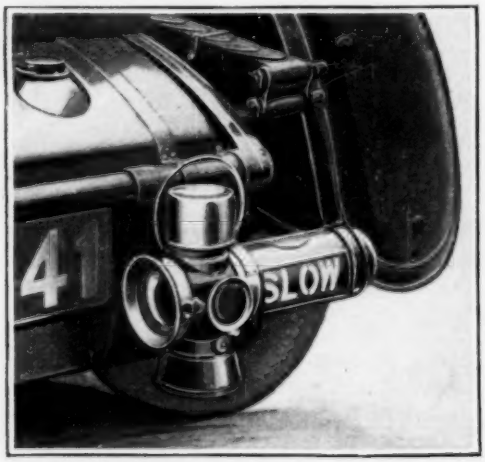
Water Raised to Successive Levels by Windmills

water reservoir, to remain inundated. Irrigating canals throughout the new district will convey fresh water to the small farms, as is the custom in the now populated sections, and windmills will doubtless still be used to lift the water from level to level in the same picturesque way which has become familiar through the work of artists of several centuries.

Room with Bed Out of Sight | Method of Controlling, by Means of Crank | Bed Down, Ready for Use

AUTOMATIC TRAFFIC WARNER USED IN ENGLAND

Among the devices being considered for lessening the number of accidents caused by collisions of motor vehicles in crowded thoroughfares and awkward turnings, is one meeting with success in England. A short cylinder of metal fits on the tail-lamp bracket, with an opalescent sleeve capable of partial rotation, which shows at two positions the words "SLOW" and "STOP." The contrivance is controlled by a wire connected with the clutch pedal, foot-brake pedal and side brake, so that when these are operated



Device Which Warns Following Driver When Forward Automobile Slows or Stops

in the normal way the device comes into action. The sleeve is returned to its original position by means of a spring.

DISAPPEARING BED FOR SMALL APARTMENTS

A patented disappearing bed recently placed on the market is so constructed that it is entirely concealed in the ceiling, and is raised and lowered in an instant by turning a crank. A continuous current of air passes around it when not in use, thus airing the bed clothing without removing. An extra drop ceiling leaves no opening when the bed is down.

STEEL PLATES COATED WITH ASPHALT AND ASBESTOS

By coating steel plates with asphalt and asbestos a new construction material is being produced that seems to be practically indestructible. This material, which takes paint well, is being subjected to the most severe practical tests, being used as roofing and siding for acid factories, steel plants, zinc-smelting works, and other installations where the fumes from the processes of manufacture make the maintenance of unprotected steel highly expensive. The steel plates are first covered with one or two layers of hot asphalt, and to this a coating of long fiber asbestos is applied under pressure. Any form of steel plates, flat, corrugated or beaded, may be used.

¶On the new postal stamps of the Chinese Republic a beautiful design of a junk under full sail takes the place of the conventional dragon.

PIANO IN BALLOON FLIGHT PLAYED IN MID-AIR

Indianapolis viewed a novel flight last fall, when a coal-gas balloon of 80,000 cu. ft. capacity carried a player piano, a young society woman of that city as performer, and a licensed aeronaut to a height of 3,000 ft., and landed seven miles from the starting point. The piano, platform, six bags of ballast and the two passengers weighed nearly 1,800 lb. At the height of 1,500 ft. the balloon struck a current of cold air which caused a rapid descent, but after sufficient ballast had been discarded, the balloon again rose and attained the elevation of 3,000 ft. No difference in the tone of the piano was noted, except that when the highest point was reached, the bass notes, when struck, vibrated until the whole bag shook.

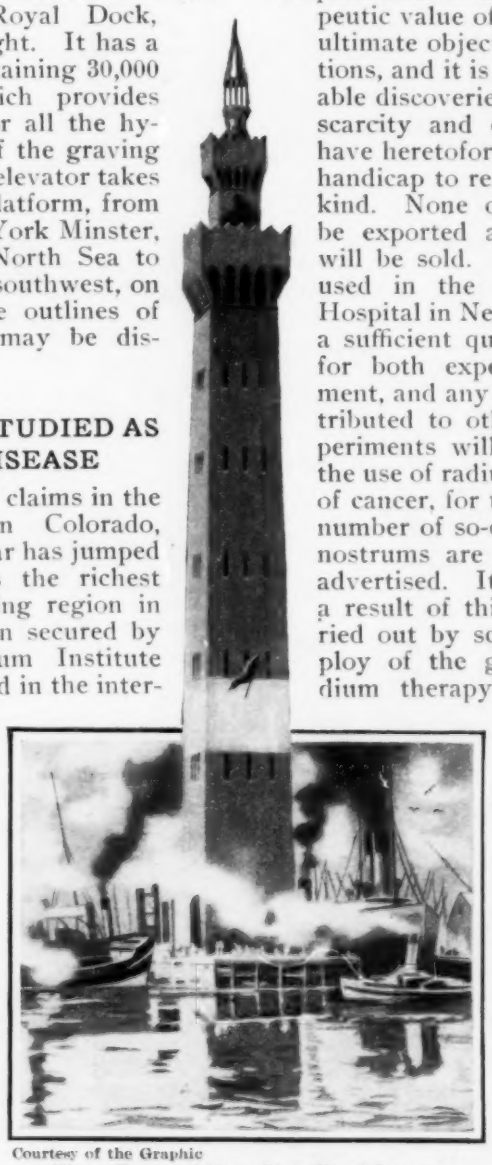
Woman Plays Piano 3,000 Feet above the Ground

The Start of a Musical Balloon Ascension

¶ Bombay, India, is soon to be supplied with hydroelectric power brought in over lines carrying 100,000 volts. A modern power installation utilizing a hydraulic head of 2,000 ft. will supply the current.

A NORTH SEA SENTINEL: GRIMSBY'S TOWER

The hydraulic tower of Grimsby, erected on the pier between the two lock-pits of the Royal Dock, stands 300 ft. in height. It has a tank at the top, containing 30,000 gal. of water, which provides working pressure for all the hydraulic machinery of the graving and fish docks. An elevator takes visitors to the top platform, from which may be seen York Minster, 25 miles over the North Sea to the east, and to the southwest, on the far horizon, the outlines of Lincoln Cathedral may be discerned.



Courtesy of the Graphic
Water Tower of More Than Usual Interest on an English Dock

RADIUM TO BE STUDIED AS CURE FOR DISEASE

A large number of claims in the Paradox Valley in Colorado, which in the past year has jumped into prominence as the richest known radium-bearing region in the world, have been secured by the National Radium Institute and will be developed in the interests of medical science. Six months ago the monthly output of ore from mines in this valley was about 100 tons, and from this quantity of ore there was being secured about 15 grains of 50-percent radium-barium bromide, the standard material used for therapeutic purposes, as explained in the August, 1913, issue of Popular Mechanics Magazine. It is expected that the output will be considerably increased and a plant is to be erected near the mines for conducting experiments in methods of extracting radium from the ore. The technical operations of this plant will be directed by the scientific staff of the United States Bureau of Mines.

Experiments to determine the therapeutic value of radium will be the ultimate object of all these operations, and it is expected that valuable discoveries will result, as the scarcity and cost of this metal have heretofore acted as a serious handicap to research work of this kind. None of the radium will be exported and probably none will be sold. Most of it will be used in the General Memorial Hospital in New York City, where a sufficient quantity will be sent for both experiment and treatment, and any surplus will be distributed to other hospitals. Experiments will center mainly on the use of radium in the treatment of cancer, for the cure of which a number of so-called "radioactive" nostrums are now being widely advertised. It is believed that as a result of this work, to be carried out by scientists in the employ of the government, a "radium therapy" having a sound scientific basis will be developed.

¶The rubber gatherers of Colombia are required by law to give the trees periods of rest in tapping them for gum. In the United States similar regulations govern the tapping of pines for turpentine in the Florida national forest.

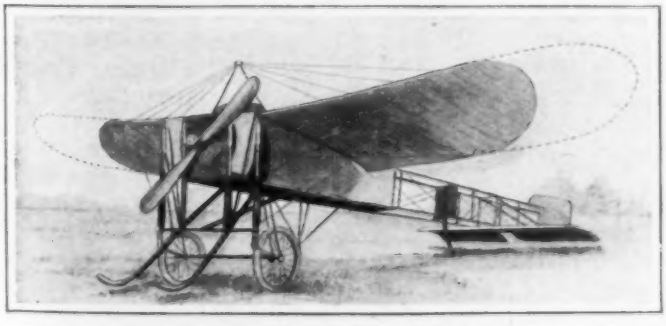
¶Philippine bolo knives are to be used hereafter in place of scythes by city employes of Portland, Ore., in cutting weeds and underbrush on vacant property.

STONE DUST PREVENTS COAL-DUST EXPLOSIONS

A simple method that is said to be effective in preventing coal-dust explosions which is in use in one of the largest collieries in England, consists in sprinkling stone dust over haulage ways and all projections and surfaces where coal dust collects. The sprinkling is done about twice a year with the idea of maintaining a dust mixture containing equal parts of stone dust and coal dust. The cost of applying this preventive is insignificant, one mine reporting it as being less than $\frac{1}{40}$ cent for each ton of coal produced.

FLYING MACHINE BUILT NOT TO FLY

Flying for students of aviation is made safe in one school by clipping 5 ft. from the wings of a Bleriot machine used in practice flights. It can be made to hop along for 20 yd. or so, and never at a greater height than 3 yd. It is designed to lessen the risks



Air Bird with Clipped Wings for Beginners

to pupils until a thorough understanding of the mechanism of the machine and the practical application of theories are gained.

ROYAL CHINESE HOUSE BOAT OF MARBLE

One of the most striking features in the grounds of the imperial summer palace, about eight miles from Peking,

Imperial Pavilion Built in Form of a House Boat

is the marble house boat. This is nothing but an ornamental pavilion, built in the form of a house boat. It rests firmly on the bottom of the little lake, and the marble wheels on either side contain steps leading down to the water's edge.

AUTOMATIC WHISTLE WARNS MINERS OF FIRE DAMP

A safety lamp with an attachment operating a continuous whistle has been invented as a result of an appeal by the Kaiser to the scientific society he formed in 1912, for safeguarding the lives of those who work underground. The "fire-damp whistle" in good air gives a continuous note which instantly alters to a tremolo when there is the slightest influx of dangerous gases, and it becomes a staccato when combustion is difficult. It can be heard a hundred yards away. These lamps will be kept burning at regular stations throughout the mine.

BRONZE INDIAN MARKS EARLY TRAIL

When the Mormons fled from Illinois after the death of Joseph Smith, they pioneered a pathway through the West which has become historical as the "Mormon Trail." They entered Iowa at or near the present city of Keokuk, named from the famous chieftain of the Sacs and Foxes, and the Daughters of the American Revolution have erected at Keokuk on a high bluff overlooking the Mississippi a statue of Chief Keokuk in bronze. Incased in the side of the pedestal is a bronze tablet which reads as follows:

To the memory of the pioneers who entered Iowa by Keokuk, the Gate City, and either settling in our state or passing farther west traveled over the well-worn path known as the Mormon Trail. With this tablet the Daughters of the American Revolution of Iowa officially open the marking of that early and important pioneer highway. "They crossed the prairies as, of old, the Pilgrims crossed the Sea, to make the West, as they made the East, the homestead of the Free." Erected October twenty-second, Nineteen hundred thirteen.

AIR BLOWN ON ICE IN NEW REFRIGERATOR

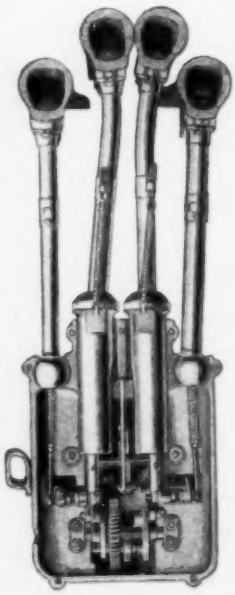
From Germany comes a new refrigerator, consisting of a well insulated chest with an ice compartment on top, the novel principle being that the air is drawn out of the refrigerating space and forced over the ice by means of a motor-driven suction pump. The air, thus cooled, is again drawn into the refrigerating space, the process being continuous.

GREATEST WATERFALL IN THE WORLD

Over four times as high as Niagara, and double the height of Victoria Falls in Central Africa, the fall of the river Portaro, a tributary of the Essequibo, in British Guiana, which plunges over a cliff 194 ft. wide into an abyss 820 ft. below, is estimated to produce 2,450,000 hp., while Niagara is rated at 1,300,000 hp. However, the situation of this South American fall is so remote that it is unlikely it will ever be developed on a scale comparable with Niagara.

NEW MILKING MACHINE USED IN SWEDEN

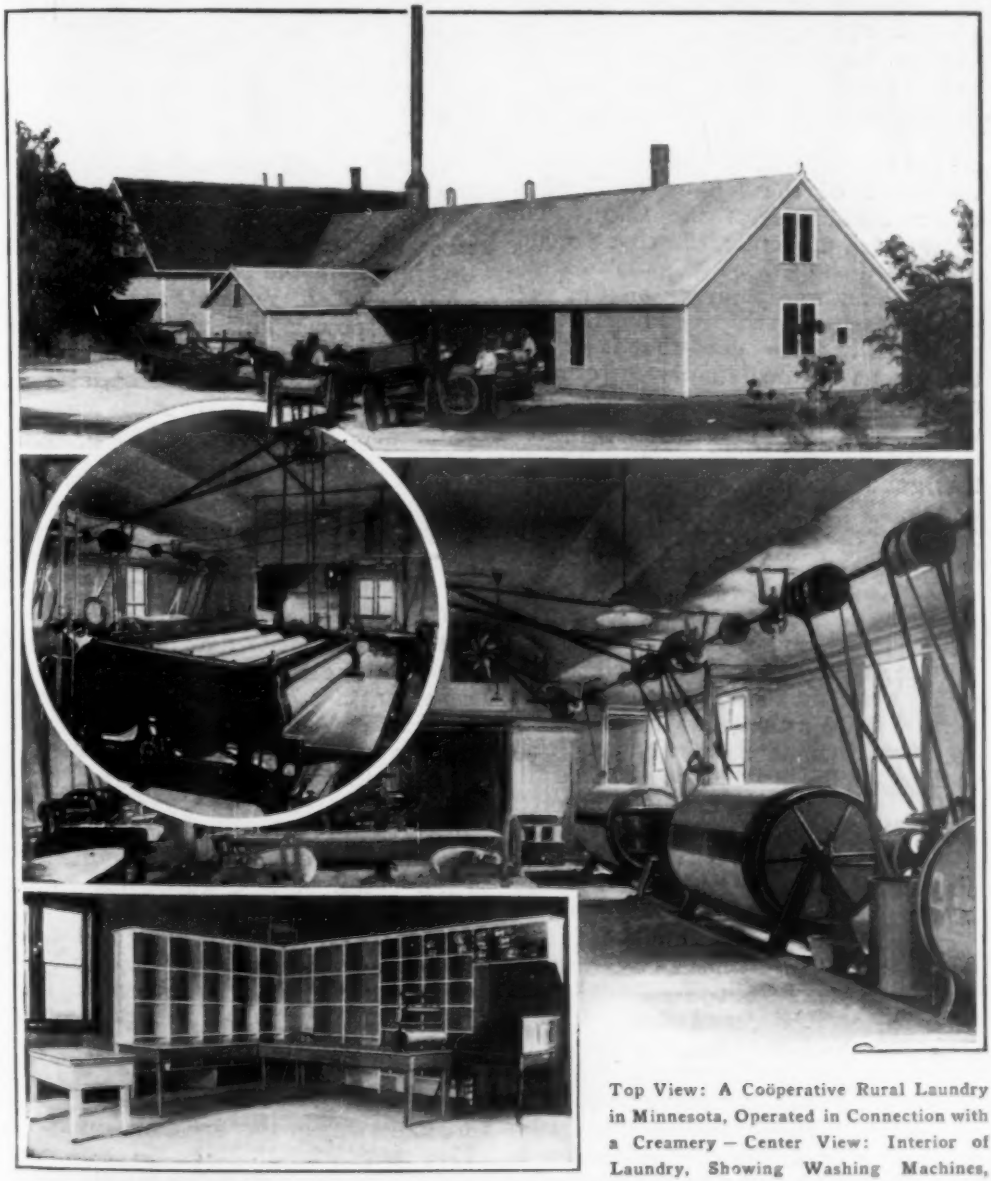
A new milking machine, significantly called "Manus" (the hand), has recently been successfully tried out in Sweden and is now in use on several dairy farms. As may be seen in the illustration, the apparatus really does bear some resemblance to a hand, and the machine, working on the pressure principle, does its work in a similar manner to hand milking. The four fingers are operated by gears and cams which give them in pairs an alternating motion, forward and back, and they are also jointed to give them an up-and-down motion to exert pressure on the udder, regulated by adjustable springs. The apparatus is fastened to the cow by two belts, and power is transmitted to it by a flexible shaft through a friction disk, driven by a line shaft along the stalls.



RURAL LAUNDRIES LESSEN LABOR OF FARM LIFE

By WALTER T. WILLIAMS

Many things have been done to reduce the strenuousness of the farmer's life, but until recently little has been done to lighten the burden of his wife. One of her hardest and most disagreeable duties is the laundering. While "blue Monday" hangs over her head, she cannot enjoy the "day of rest," which, proverbially at least, precedes it. It is said that farmers' wives



The Shipping Room, Where Finished Laundry is Checked Out for Delivery

Top View: A Coöperative Rural Laundry in Minnesota, Operated in Connection with a Creamery — Center View: Interior of Laundry, Showing Washing Machines, Mangles, and Other Equipment — Insert: A Close View of a Power-Driven Mangle

are more in danger of insanity than other women. Perhaps the washday dread is in no small measure responsible for this.

Numerous domestic washers have been devised, which in a manner lessen the labor and disagreeable features of doing the family washing, but they do not sufficiently reduce them. Complete relief is what is desired, and from what has transpired, in some sections at least, the men are apparently willing to pay for it. Domestic help not being obtainable, the power laundry has been resorted to. In a few communities, power laundries have been installed to take care of the laundering for the entire household of the farm. The charges are moderate, the cost depending on which of three plans is adopted.

The laundry operating on the first plan does the washing and ironing of all of the articles sent—that is, everything sent to the laundry is returned ready for use. The laundry operating under the second plan does not do all the ironing, but delivers only part of the goods ironed and the rest unironed. This is known in power laundries as "the rough-dry system." The flat work, which embraces the sheets, tablecloths, napkins, pillow slips, towels, and such articles, is nicely ironed. Articles of apparel, such as shirts, shirtwaists, dresses, skirts, and underwear, are sent home dried, but not ironed. The articles which require it are starched, and it is only necessary to dampen and iron them. This is the most popular method. The charge for laundering under this plan is within the reach of any fairly prosperous farmer, being only 5 or 6 cents a pound. The third plan includes only the washing of the articles, which are delivered damp—that is, only part of the moisture is removed from them—and must be dried at home, and the necessary starching and the ironing must be done there. The charge for this is very small, usually being about 50 or 60 cents a "bushel," the goods usually being sent to and from the laundry in bushel baskets, or sacks. A bushel of soiled linen is quite a large washing.

At Chatfield, Minn., is a rural laundry which is equipped for doing finished laundering, but most of its work is done on the "rough-dry" plan. It is operated in connection with a creamery, $2,000 of the stock being owned by the creamery company and $3,000 by the farmers. The coöperative plan of running creameries is very general in some sections of the country, and if a sufficient amount of patronage can be had, a small laundry can be operated in connection with it very profitably. Illustrations of the interior and exterior of this plant are shown herewith. The equipment, exclusive of the building, engine, and boiler, cost about $2,400. This is one of several coöperative laundries now established at various points in the country.

It should be remembered that operating a power laundry requires skill and experience, and that at least one high-priced man to superintend it is necessary, so that poor work may not jeopardize the success of the undertaking.

HOW FRESH WATER AFFECTS OYSTER GROWTH

Contrary to the generally accepted belief of biologists that oysters do not thrive in fresh water, a case was presented at a recent biological congress in France where young oysters developed and propagated very rapidly in the mouth of the Macta, a small river in Algeria. Here a sand bank has risen to separate the river from the Mediterranean, and receiving very little influx of salt water, the oyster beds have been submerged in fresh water. While the old oysters did not withstand the change, the younger ones are thriving, controverting the belief that salt water is necessary to their development.

¶Chalk marks on tires are used by Los Angeles policemen in enforcing the ordinance forbidding cars to stand at the curb more than 15 minutes.

Railroad Coaling Device Destroyed by Collision

MODERN COALING STATION WRECKED

In the October, 1913, issue of Popular Mechanics Magazine appeared a picture and description of a steel coaling tank supported on a steel trestle directly over the tracks. Early in November a derailed freight car struck one of the supporting pillars, entirely wrecking the structure, which contained 165 tons of coal at the time. Fortunately no one was hurt in the accident, but a total damage of some $20,000 was done. Removing the wreckage was a tedious matter, nearly a week being consumed before the tracks were cleared.

AIRMAN TO PATROL POWER TRANSMISSION LINES

The transmission lines between Oakland and Oroville, Cal., will be regularly patrolled by an airman carrying a repair operator as passenger. The high-tension lines bring to Oakland the power developed 125 miles away, and trips will be made twice weekly over the entire system.

CHILD'S PORTABLE FOLDING SEAT

A French magazine writer who is an enthusiast in Alpine climbing has designed a contrivance whereby he is enabled to take his little daughter with him on some of his excursions. A light adjustable framework, with folding seat, is attached to his shoulders by straps; the baby is securely strapped in her comfortable seat, and the Alps are scaled "en famille."

Courtesy La Nature

¶Cleveland's three public dance halls in the parks brought in a profit of $10,000 in 1913, 666,000 couples paying 3 cents each for the privilege of dancing.

HARVESTING LEAD FROM THE SOIL

A crop of lead is being harvested from the soil with ordinary farm machinery by a man in Ohio. With a harrow, a road scraper, a sweeper, an old-fashioned fanning mill, and a gasoline engine, he is gleaning many pounds of lead and a living from the waste shot scattered through the soil on the grounds of various gun clubs. With two helpers, he cuts up the sod with his harrow, rakes, spreads and shakes it, and then gathers it into piles. When most of the shot has been shaken out of the sod, he sweeps the grounds and puts the sweepings through his fanning mill. The shot that remains in the mill after the dirt has been blown away is easily cast into "pigs" for shipment. As one man scatters from 8 to 12 lb. of shot in an afternoon's trap shooting, the size of the crop of lead to be harvested from the grounds of a large gun club can easily be estimated. About 40,000 lb. were taken from the premises of one club.

A Pile of "Ore" Harvested from a Gun Club's Grounds; Lead Mold at Left and Lead "Pig" in Foreground

DEVICE FOR STOPPING MOTORISTS

A chain or twisted wire with sharp projecting points is used by customs authorities on the Franco-Belgian frontier, to stop swiftly moving automobiles which refuse to halt for inspection. Motorists hesitate to encounter a barrier which threatens four punctured tires, and customs officers take advantage of this very human weakness to baffle smugglers. At certain places on the frontier travelers by automobile are required to stop that their baggage may be investigated. If they refuse to heed the signal, the officer in charge notifies another, down the road a bit, and the "porcupine," as it is called, is quickly dragged across the road.

Fanning Mill Used to Separate the Shot from the Soil

Courtesy of the Daily Mirror

Dragging the "Porcupine" Across the Street in Front of Speeding Auto

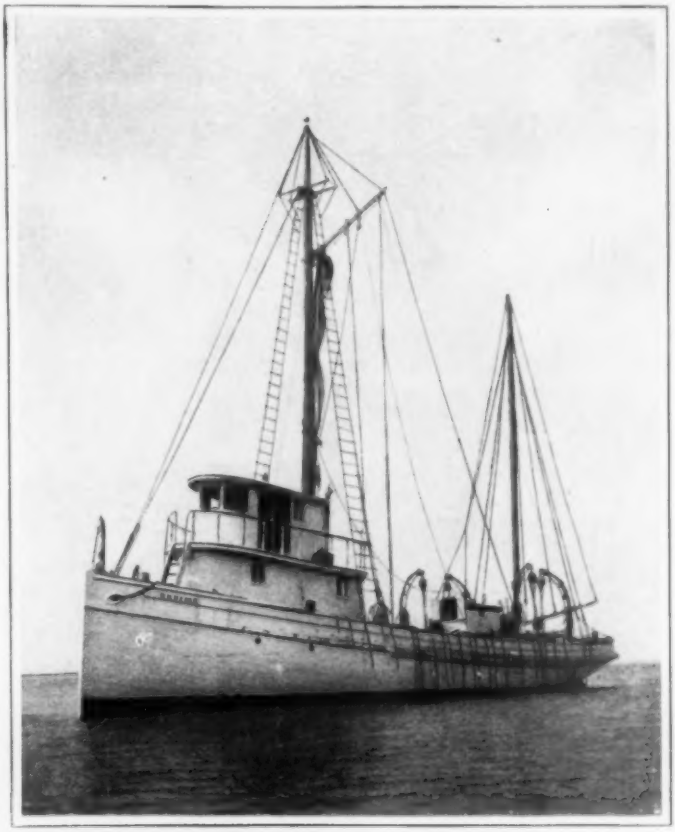
AIRSHIPS TO GUARD INDIAN FRONTIERS

Airship patrols have been suggested as a means of watching the frontiers of India and protecting them from the raids of neighboring tribesmen. It is impossible at present to protect the frontiers without a great body of soldiers, because the tribesmen are so quick in their movements and so well acquainted with the country. Their lines of retreat are so numerous that they can retire after a successful raid before they can be caught. Airships equipped with powerful searchlights and wireless apparatus, could patrol the frontiers and watch the tribesmen's movements with great ease, it is thought, and limit the possibility of secrecy, surprise, and mobility, which are the tribesmen's chief weapons. Three airships, stationed at Quetta, Dera Ismail Khan, and Peshawar, could patrol the whole frontier and protect the occupied lowlands on the right bank of the Indus. While acting as a discouragement of raids, the airships with their wireless equipment could aid in the stationing of the defending forces. An attempt to supply the Indian army with a flying corps is already being made, and a rapid development is expected.

¶A new English law pronounces any mine unfit to be worked if the air in it contains more than 1¼ per cent of carbon dioxide or less than 19 per cent of oxygen, while there must not be more than ¼ of 1 per cent of inflammable gas.

SCHOONER USES VARIOUS KINDS OF POWER

A fishing schooner recently put into service at Beaufort, N. C., is equipped with an engine which uses kerosene, gasoline or coal gas as a fuel, and is also provided with a producer for making gas from coal. In addition to this the vessel has a full equipment of sails, and is, probably, the only craft in the world provided with such a wide range of motive power. This vessel is 85 ft. long and has a beam of 18 ft. The engine is rated at 75 hp., sufficient to drive the schooner at a rate of nine miles an hour.



Schooner Equipped with Gas Producer and Engine That Uses Kerosene, Gasoline or Coal Gas

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¶Plans are being considered for another trans-Siberian railroad located south of the existing railroad.

MONUMENT MARKS HISTORIC FLIGHT

Santos-Dumont's dirigible flight, 12 years ago, about the Eiffel Tower has been commemorated by the Aero Club

Monument Raised in Paris to Santos-Dumont

of France by a monument at Saint-Cloud. Upon a granite base, a bronze figure of a winged man ready for flight stands poised. On the occasion of the unveiling of the monument Santos-Dumont was presented with the insignia of Commander of the Legion of Honor.

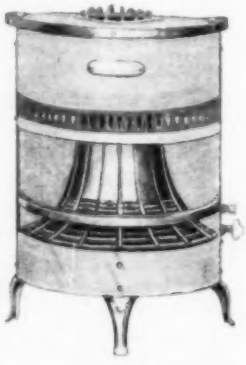
ANCIENT SEEDS INFERTILE, SCIENTISTS SAY

In the November, 1913, issue of this magazine there was illustrated and described some extraordinarily tall corn which was grown at Downer's Grove, Ill., during the past summer. Through a typographical error it was made to appear that this corn averaged 40 ears to the stalk. This was not the case, as the total number of ears on the nine stalks shown in the picture was 40, one stalk bearing but one ear and the other eight bearing 39 ears among them.

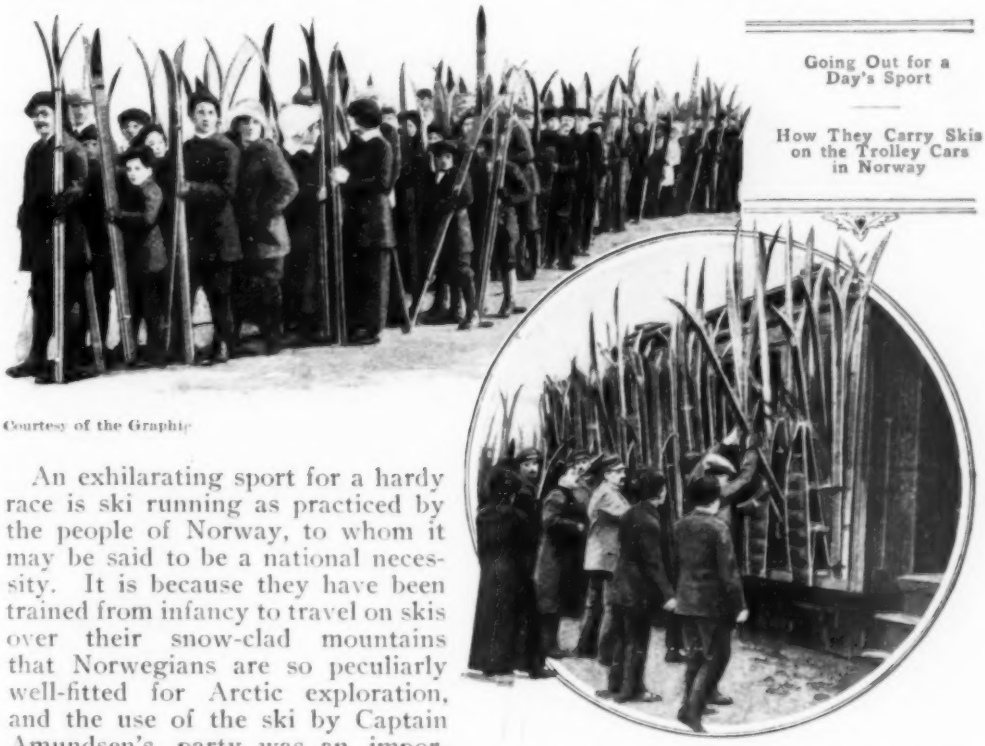
According to the belief current among several northern Illinois farmers who have grown corn from this same strain of seed, the original seed was found in an Indian mound in Colorado by an exploring party from the Smithsonian Institution. The Smithsonian Institution, however, has no record of such a discovery, while scientists now discredit all accounts of the germination of seeds that have been kept for any considerable period of years. The belief that "mummy wheat," found in the tombs of ancient Egypt, has sprouted and developed after thousands of years is a persistent one, but it is now classed with the divining rod, the hoop snake and other similar popular beliefs that have no foundation in fact.

ROUND-FRONT GAS HEATER SATISFACTORY

Radiating light and heat on all sides, a new round-front gas heater is being marketed. The round front causes radiation on both sides as well as in front and the warm, cheerful glow from the reflector means comfort on a cold night. Cold air is drawn off the floor through the large end of the reflector, which is funnel-shaped, and passes directly over the fire box, up through the small end and out at the top of the heater. The heater is equipped with a 3-in. flue connection, permitting the free escape of the products of combustion.



WHY NORWAY WAS FIRST AT THE SOUTH POLE



Going Out for a Day's Sport

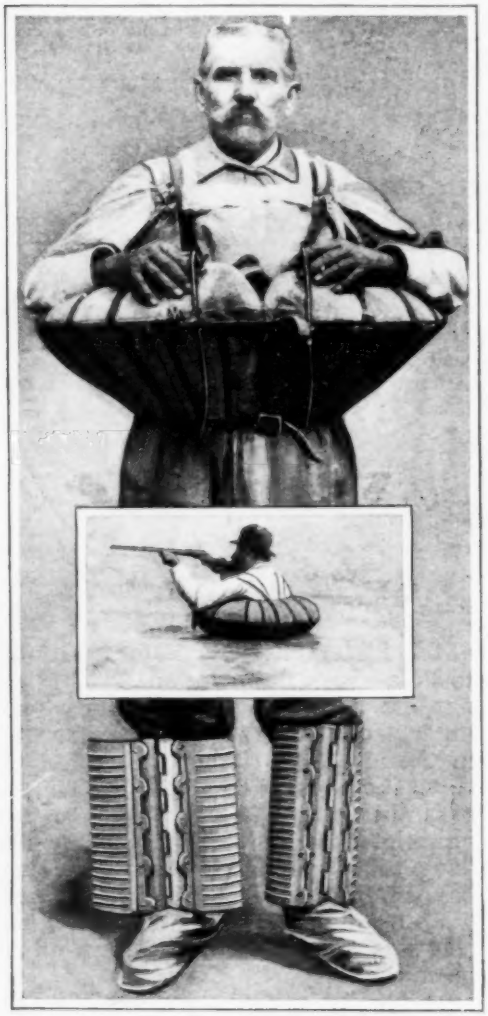
How They Carry Skis on the Trolley Cars in Norway

Courtesy of the Graphic

An exhilarating sport for a hardy race is ski running as practiced by the people of Norway, to whom it may be said to be a national necessity. It is because they have been trained from infancy to travel on skis over their snow-clad mountains that Norwegians are so peculiarly well-fitted for Arctic exploration, and the use of the ski by Captain Amundsen's party was an important factor in the successful termination of the expedition which resulted in placing the Norwegian flag at the South Pole. The skis, long, graceful strips of light wood, afford a means of traversing snow-covered areas with ease. An ordinary ski runner is expected to maintain a speed of 8 or 9 miles an hour for long periods. The longest race on skis, the distance being nearly 140 miles, was run in less than 22 hours, rests included. A race in Christiania, won by a peasant in less than 5 hours, covered 32 miles, and was laid out over hilly ground with all sorts of difficulties designed to test the skill and endurance of competitors. An expert ski runner is able to take flying leaps with the greatest ease, and annual tournaments are arranged in which proficiency in jumping is demanded. A steep hillside with a slope of 40 deg. or more, is chosen, and the runner dashes down the hill at great speed. A bank is built near the middle of the descent, if there does not happen to be a projecting rock to answer the purpose, and the terrific velocity which he acquires throws the runner far out in the air. The perpendicular fall of these jumps is often 40 ft., the height of a three-story house, which to the uninitiated makes ski jumping seem a dangerous sport, but few accidents happen, and the jumper has trained himself to preserve his equilibrium. But skis are by no means simply implements of sport. They are an indispensable means of locomotion, and the inhabitants of Norway look upon the ski as the rider looks upon his horse. The schools, the post office and the traveler depend upon them. The government has equipped the troops stationed in northern provinces with skis when out on active duty in the long winter. In America much interest has developed and tournaments are frequent in northern states where there is a large Scandinavian population.

LIFE PRESERVER PERMITS ONE TO WALK ON WATER

Equipped with the ordinary life preserver one finds locomotion difficult, if not impossible. Even a good swimmer finds it extremely hard to make progress impeded by the cork or pneumatic rings. A St. Louis inventor offers a solution to these difficulties in a new life preserver, or safety belt, combined with webs for the ankles to control the forward movement of the body. Without knowing anything about swimming, one can, by this system, walk through several miles of water without greater fatigue than strenuous walking on land. The webs are made of aluminum, and have a total spread of 9 in. by 9 in. in height. The center piece, or shin attachment, is hinged to allow greater comfort in attaching it to the ankles with straps and buckles. To each side of the center piece is hinged a corrugated leaf of aluminum on which are five braces to prevent the leaf from opening farther than to give a maximum spread against the water. When the foot is forced forward the leaf is forced against the ankle; when the foot is forced back the leaf opens, giving a strong grip on the water.



Life Belt, Showing Tubes through Which It is Inflated and Aluminum Webs Which Make Walking in Deep Water Possible; Insert, Out for a Day's Shooting in the Mississippi

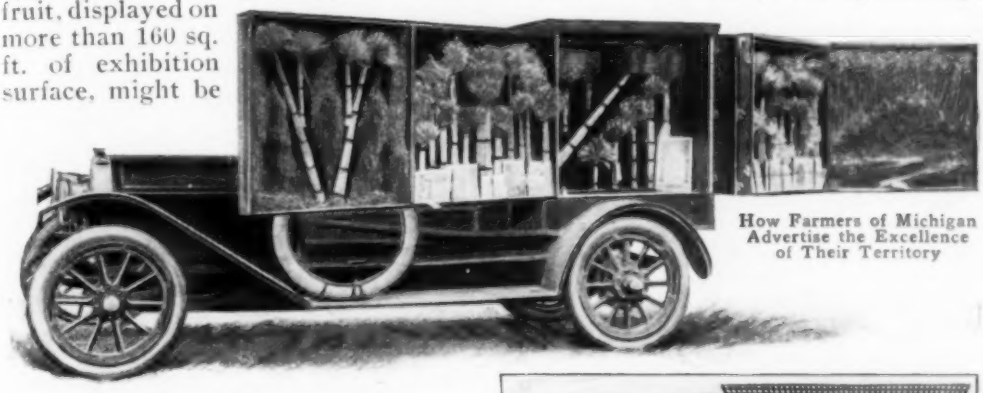
WIRELESS CARRIES SOUND ACROSS ATLANTIC

William Marconi transmitted vocal sounds across the Atlantic Ocean, from Clifden, Ireland, to Glace Bay, Nova Scotia, recently by wireless telephone. No conversation was held during the experiments, but the inventor of wireless telegraphy succeeded in making vocal sounds heard for half an hour over his new wireless phone. The problem being studied is to reduce the high-frequency wave, so that conversation can be possible. The human ear cannot hear vibrations higher than 45,000 per minute, and an instrument is sought which will tone down the vibrations in use in wireless below that number.

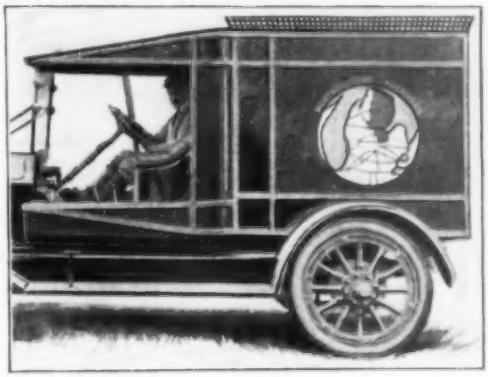
AGRICULTURAL ADVERTISING BY AUTOMOBILE

A farmers' board of trade in northern Michigan has adopted the plan of advertising their land and products throughout the Middle West by means of an advertising auto tour. The car was designed by amateurs in the office of the Northeastern Michigan Development Bureau, comprising representative farmers from 16 counties. The chassis of a large 50-hp. 6-cyl. automo-

bile was used, and a cabinet arranged upon it in such a way that, when opened, samples of grains, grasses, and fruit, displayed on more than 160 sq. ft. of exhibition surface, might be seen to advantage. Twenty electric lights, supplied from the storage battery of the car, illuminate the display for night exhibition, and a gas stereopticon lantern with appropriate slides makes evening illustrated lectures on products and territory possible. When weather forbids outdoor display, the cabinet may be removed to some convenient shelter.



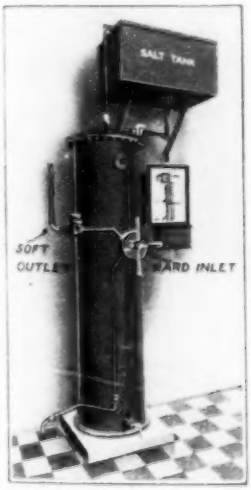
How Farmers of Michigan Advertise the Excellence of Their Territory



The Farm-Exhibit Automobile Closed and Ready for the Road

WATER SOFTENER ENGLISH SANITARY DEVICE

Asserting that half the ills that flesh is heir to come from impurities in water used in household and commercial plants, an English concern has placed on the market a water softener, by means of which "hard" water is freed from salts of calcium and magnesium, making it palatable for cooking and drinking use, as well as avoiding injurious scale in boilers and heaters. The device, consists of a metal tank inclosing a filter bed of secret composition, between two layers of gravel. The entire control of the softener is effected by one special tap, by which the water is admitted into the tank, reversed for cleansing purposes, or directed into a tank containing a solution of common salt, whereby the secret solution is "regenerated" by chemical reaction.



MAKE CONCENTRATED ACID FROM THE AIR

A new process for the manufacture of concentrated nitric acid from water and atmospheric nitrogen has been patented by a Norwegian company engaged in producing calcium nitrate. This company has been making a 30-per-cent nitric acid, but the new process enables it to produce a 98-per-cent acid, using the water from the Maane River and air. The acid has already been used successfully by factories manufacturing explosives.

MOTOR TRUCK TOWING CANAL BOATS

Towing three canal boats, a total load of 731 tons, at a speed of four miles an hour, a motor truck demonstrated a new commercial field which may develop into vast proportions. Later, the same truck hauled five barges, with a total weight of 1,249 tons, with no load at all on the truck, which was capable of exerting only a third of its maximum pull without slipping its wheels. The truck used was of the hydraulic-transmission type.

Motor Truck Displaces Mules on Towpath

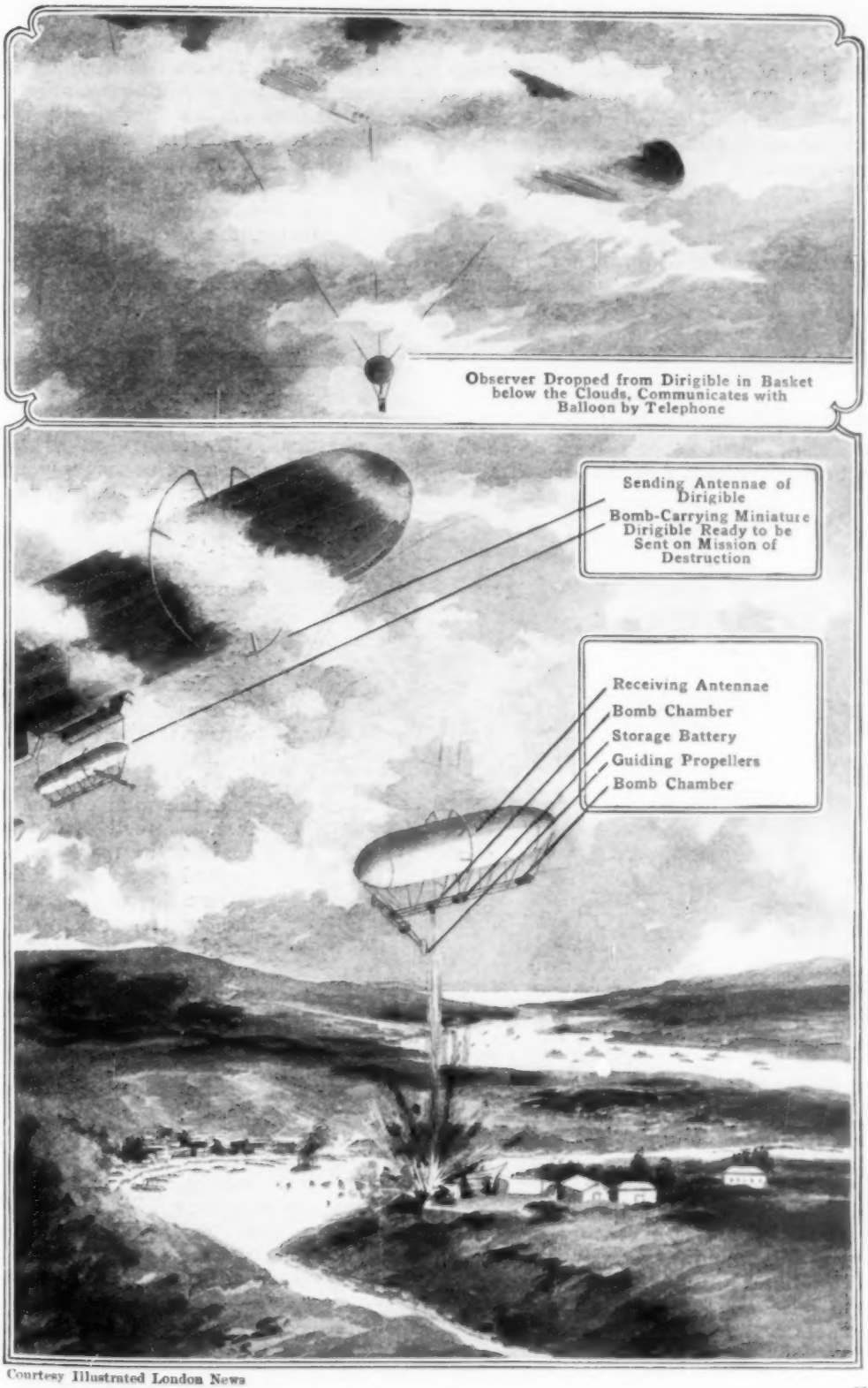
"OXYGENIZED ICE" USED FOR REFRIGERATION

One of the recent developments in refrigeration is the use of "oxygenized ice," which is made simply by adding peroxide of hydrogen to the ice while it is forming. This ice is slightly tinted with some soluble dyestuff, and is used only for refrigeration purposes without contact with food products. Owing to the release of oxygen the air that comes from the melting ice possesses valuable antiseptic qualities.

USE CLOUDS AS CURTAINS IN AERIAL WARFARE

The experience of airmen during the recent Bulgarian war leads to the belief that any altitude less than 4,000 ft. above an active enemy is well within the danger zone of vertical fire. To secure the greatest possible information of the lay of the ground and the movements of troops, the air scouts must keep to the higher altitudes, and the suggestion is made that clouds form an effective screen for observers on duty aloft. Aeroplanes and dirigibles will endeavor to take advantage of cloud masks for concealment, while maneuvering to gain at the same time accurate view of the territory occupied by hostile forces.

One inventor has applied for a patent on a device whereby observations may be made from a dirigible balloon hidden from the enemy by clouds. An observer is dropped from the dirigible in a basket suspended from a cable, and communicates with those aboard the balloon by a telephone. Thus he is below the clouds, while the dirigible is above them and out of sight. The observer can see all that is required with very little risk of being seen by the enemy, and still less danger of being hit. By phone he can pilot the craft and maneuver for position, and drop bombs, use high-powered rifles or other offensive weapons. Another interesting feature is proposed in connection with dirigible balloons in warfare, in which a large balloon carries a number of smaller craft, like lifeboats on a liner. These little dirigibles are to be fitted with bomb chambers, opening by wireless. The large airship will be maneuvered at a great height, and when in proper position one of the small dirigibles, not carrying a crew, will be dispatched, and steered by wireless waves from the parent ship to a favorable place over the enemy's fortifications. The bombs will then be dropped, a trapdoor being opened in the bomb chamber by wireless. It is considered possible to steer the small dirigible back to the parent


Observer Dropped from Dirigible in Basket below the Clouds, Communicates with Balloon by Telephone
Sending Antennae of Dirigible
Bomb-Carrying Miniature Dirigible Ready to be Sent on Mission of Destruction
Receiving Antennae
Bomb Chamber
Storage Battery
Guiding Propellers
Bomb Chamber

Courtesy Illustrated London News

airship, but its loss would be an insignificant matter. Three miles is considered at this time an effective active radius of these bomb-dropping craft as planned. They would weigh about 100 lb., and would carry two or more bombs. A swivel beam attached to the front of the dirigible, with two propellers mounted on it, is the means proposed for steering these miniature airships. Both the transmitting aerial and the receiving antennae are shown in the illustration as circling the respective gas bags on large and smaller craft. The "fifth arm" of military service, as the aerial navy is called, offers a wide field for boldness in executing startling coups, the adoption of wireless control presenting almost limitless possibilities.

PORTABLE DESK CHAIR OF MANY USES

A portable combination chair and desk, designed especially for open-air schools, has been devised by an Italian inventor. Its use and its compactness when folded are illustrated in the accompanying picture. The desk part, which also serves as a back rest, contains two drawers, one for pencils, ink, and inkstand, and the other for papers and books. It is especially useful in open-air schools because it can be used as a desk, chair, or knapsack for books, and is light enough for a child to carry. Artists find it useful as an easel and as a case for art materials.

The Chair can be Used as a Writing Desk, an Easel, or as a Knapsack for Books

BATTLESHIP "LOUISIANA" FLOODED AT SEA

The bravery of the engine-room crew of the battleship "Louisiana" saved the big fighter from a more or less serious predicament on the day before her commander, Capt. Templin M. Potts, retired. A valve bonnet blew off, flooding the starboard engine room with water. The accident occurred in Narragansett Bay. The rush of the sea through the passage opened by the displacement of the bonnet carried the men off their feet, forced them against the machinery, and threatened to drown them. At times the water rose to a height of 6 ft. in the engine room, but the men worked on, now swimming a few strokes, now grasping a bar or a wheel overhead. Even with the pumps working, more water poured in than could be disposed of, until a partial stoppage had been effected.

The ship was anchored safely, with a broad, shelving beach to run on if necessary. A diver was sent overboard and placed a new bonnet on the auxiliary overboard discharge valve.

¶The United States Navy consumed 30 million gallons of fuel oil last year.

ANOTHER GREAT RAILWAY BRIDGE PLANNED

A bridge which will be longer than the great structure across the Hoang-Ho and will far exceed the length of the Firth-of-Forth bridge is planned to connect the Swedish with the German railway systems, displacing one of the car ferries now in use. The German terminal is at Sassnitz on the island of Rügen. Thence the train proceeds to Altefähr on the opposite side of the island and just across from Stralsund on the mainland. To cross the separating strait a bridge is proposed which would be about 11,000 ft. in length. In the plan 23 piers support the proposed structure, which rises to a height of 105 ft. above the water.

STERILE COVER PROTECTS MILK PAIL

Keeping the milk pure and uncontaminated from its source is the intent of the invention recently put on the market and illustrated herewith. It is a milk-pail cover of cloth, with two funnel-shaped metal tips, equipped with small wire hooks to be hung from the fingers of either hand while milking. The cloth cover is clamped on the milk pail with wire clips and tube-like projections from the cover permit free movement of the hands while milking.

¶Moving-picture shows will be conducted on transatlantic liners, if the insurance underwriters will consent.

HEARSE CROSSES CONTINENT ON TRIP TO GRAVE

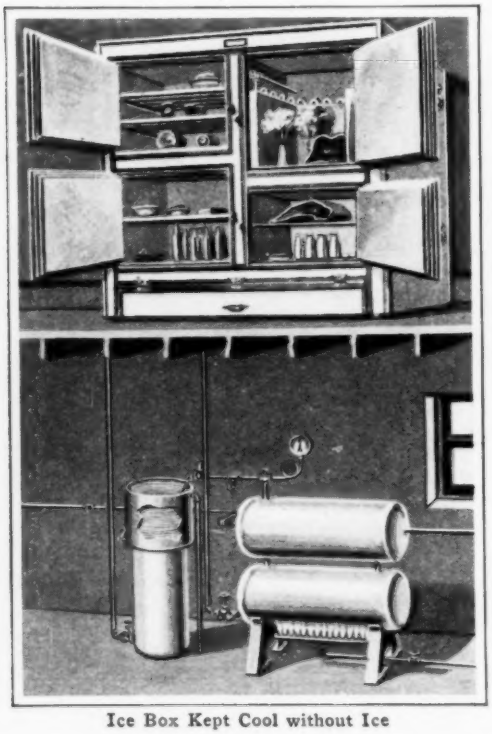
A New York salesman who died in San Francisco, requested that his body be transported to his former home by automobile. His dying wish was respected and arrangements were made by a local undertaker to convey the body across America in an automobile hearse. Forty days were consumed in the 4,500-mile trip, during which time the undertaker and two assistants were constant watchers. A supply of bedding, cooking utensils, food and fuel was taken along, and the "longest trip from the undertaking rooms to the grave" was made without accident.

Photo by Paul Thompson
Automobile Hearse Which Made Long Trip across America

ICELESS REFRIGERATOR FOR HOME USE

An apparatus that provides iceless refrigeration for ice boxes of ordinary size, and is particularly adapted to use in the home, has been developed and placed on the market. There are no moving parts in this apparatus and no engine or other motive power is required. In using, two horizontal cylinders are partly filled with aqua ammonia, which is simply a mixture of water and ammonia, and this is heated to the boiling point by a burner placed under the lower cylinder. The heating is usually done with gas or gasoline, but kerosene, alcohol, steam, electricity, or charcoal may be used. The heating causes the ammonia to pass off

as a gas through the piping into a condenser at the top of the upright cylinder shown at the left. Here the

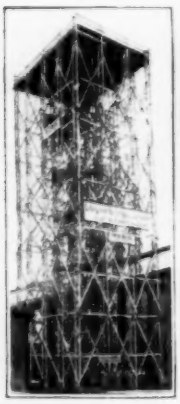


Ice Box Kept Cool without Ice

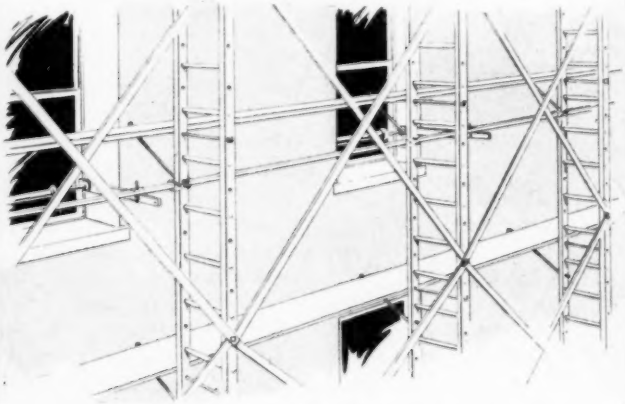
ammonia gas is cooled and reduced to a liquid state by running water, the liquid ammonia being stored in the cylinder below the condenser. As soon as the storage cylinder is filled, the fire under the heating tanks is extinguished and water is passed through the coils contained in these tanks. This cooling condenses the liquid and gas in the tanks and causes a suction in the piping that runs through the ice box to the storage cylinder. Since ammonia will expand rapidly when given the necessary room, there is a flow of gas from the storage cylinder through the expansion coils in the ice box to the heating cylinders, where it is again absorbed by the water. Refrigeration is due to the fact that the ammonia, in expanding, takes up heat from all sides, and the apparatus is so arranged that practically all this expansion occurs in the coils located in the ice box.

GERMAN LADDER STAGING LARGELY USED

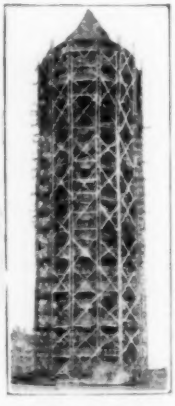
Utilizing ladders in scaffolding, big and little, German contractors erect structures of great strength and stability in amazingly short time. For repair work the ladders are set on short lengths of board as mudsills, and are held to the wall by the spacer sticks engaging screw-jack clamps set in the window jambs. In larger erection work the ladder verticals are two-piece posts with wooden rungs as spreaders, and successive lengths are lapped on each other, like parts of an ordinary extension ladder, and are connected by hooks, or in the case of heavy scaffold-



A Scaffolding Built of Ladders Used by German Contractors



Ladder Scaffolding is Held to the Wall by Spacer Sticks Clamped to the Window Jambs



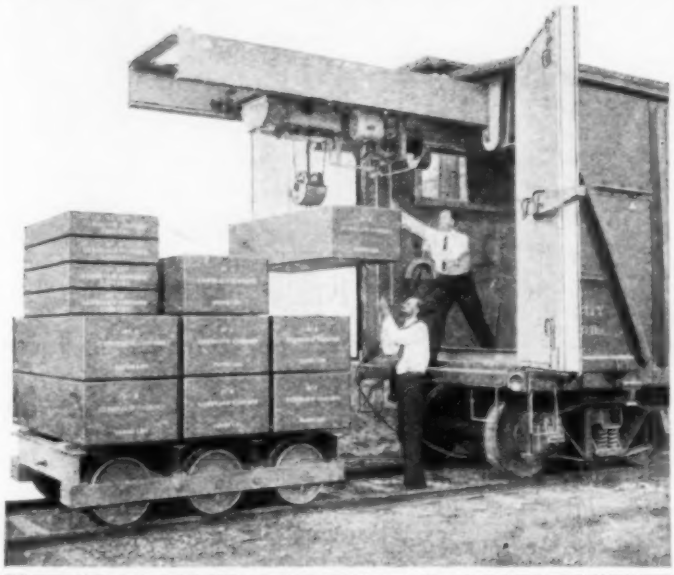
Ladder Staging Used in Construction of Tall Water Tower

ing, by steel splice-plates on the sides of the ladders. It is interesting to note that between the wooden rungs the ladder sides have holes for temporary rungs of steel rod, and these rods are used for attaching the hooks connecting two lengths of ladder, and for supporting runway boards and beams from which tackle blocks are hung. The holes are also used for the bolts which clamp the scaffold braces in place. The scaffold is built upward by simply laying additional lengths of ladder alongside those already in place, sliding them up until only the necessary amount of lap is left, and hooking the ladders together, then setting the wall spacers and braces of the new tier.

BUREAU OF STANDARDS HAS NEW TESTING CAR

A new scale-testing car with extended crane bridge, weights and truck has been acquired by the U. S. Bureau of Standards for use in testing and standardizing the weights and measures used in the country. A special car has been designed of heavy standard type with steel underframe, roof and doors, and steel-braced sides. One end is closed and heavily reinforced with steel, and the other end has two large doors. An electric generator, radiator and fan and storage battery are carried, and a frame for carrying the crane bridge is built into the car at the open end. Complete sleeping and toilet facilities are provided also. When utilized, the car is placed with the open end next to the scale to be tested, the crane bridge run out, the small truck unloaded and weights placed thereon, and the truck run on the scale and markings noted checking the accuracy of the scale.

New Standard Scale Car Built for the Government



Photos Copyrighted by Brown & Dawson, Stamford, Conn.

Method of Testing Platform Scales Used by Bureau of Standards

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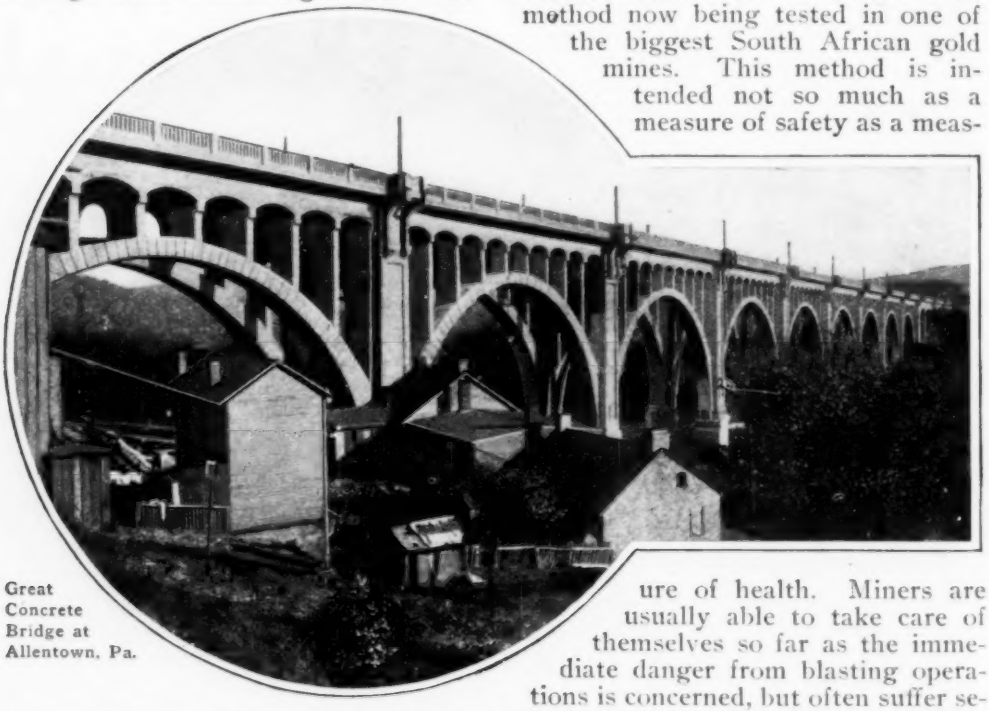
¶Rome, Italy, and the bathing beach at Ostia, its ancient seaport, 18 miles away, are to be connected by railroad.

LARGEST CONCRETE BRIDGE COMPLETED

There is no other reinforced-concrete bridge so long that is as high, and none so high that is as long as the one just completed which spans the deep ravine between Allentown and South Allentown, Pa. The bridge is of arch design, with solid spandrel walls and contains 33,000 cu. yd. of concrete, 50,000 bbl. of cement and 450 tons of reinforcing steel, in the half-mile viaduct on Eighth Street. Twenty-six hundred feet long, 46 ft. wide and 150 ft. high, it affords two sidewalks, a highway for teams and automobiles, and accommodates two electric-railway tracks.



Great Concrete Bridge at Allentown, Pa.

¶A Cleveland firm employing 500 persons in the manufacture of electric lamps, increases efficiency by keeping a stock of umbrellas and rubbers. For one dollar an employe receives a check which entitles him to protection against any unexpected storm. The dollar is refunded when the check is surrendered.

ELECTRIC BLASTING IN SOUTH AFRICAN MINES

Firing all the charges in a mine simultaneously by pressing a button in a control station on the surface is a method now being tested in one of the biggest South African gold mines. This method is intended not so much as a measure of safety as a measure of health. Miners are usually able to take care of themselves so far as the immediate danger from blasting operations is concerned, but often suffer severely from inhaling the fine dust following the explosion of a charge, and the prevalence of miner's phthisis among South African miners is believed to come from this. In the new system of firing all the miners are taken from the mine before the charges are fired and are not allowed to return until after the mine has been thoroughly ventilated. In arranging for the discharge the fuse in each charge is connected by wires with a main cable placed in the drift, which is connected with the generators of the electric-light plant. The circuit is closed and the charges fired by pressing the button in the control station.

¶As a rule the most dangerous forest-fire periods are the middle and late summer in the West, and the spring and fall in the East.

WASHINGTON'S OLD SURVEY FOUND CORRECT

In protecting the headwaters of navigable streams under the forest-reserve law, the government is surveying lines in the Appalachian Mountains where George Washington ran his famous boundaries for Lord Fairfax in pre-Revolutionary days. In 1751, Washington, then 19 years of age, surveyed the line which was to divide Augusta and Frederick Counties, Virginia. According to the organic act for the formation of these counties, it was required that the line should run straight from the head spring of the Hedgman River, one of the sources of the Rappahannock, to the head spring of the Potomac. It was first necessary to get the approximate course by building bonfires on the intervening high points. Then, starting from the top of the Massanutten Mountains, the line was run straightaway to the northwest. In what is known today as West Virginia a large rock marks the southwest corner of Garrett County, Md., and the southeast corner of Preston County, W. Va. This is known as the Fairfax Stone, and is one of the landmarks mentioned in Washington's notes. Washington, of course, used a simple compass, yet the new governmental survey, made with high-power transits and all the refined and accurate methods of modern surveying, has found but little variation, so carefully was the line run originally.

GAS PLUG CONTACT GIVES FLEXIBILITY

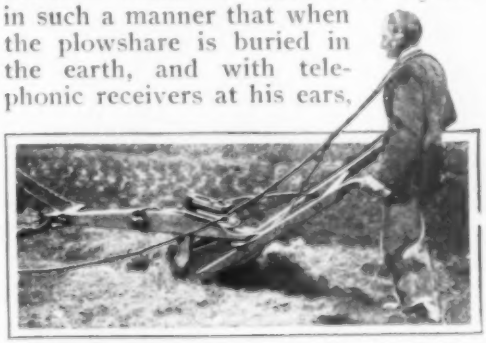
An invention designed to give gas fixtures the flexibility of electric fixtures has been placed on the market. Heretofore it has not been possible to make connection for gas appliances with the same ease as with electric fixtures. This advantage on the part of electricity has been partly overcome by a wall plug for gas lamps, gas irons and the like, which is as inconspicuous as an electric plug contact. The new contacts look very much like electric ones, and are so arranged that they close gas-tight, if not connected. The

Device Which Permits Much Flexibility in Gas Fixtures

connection is effected in the same way as with electricity. The invention is the work of a German gas engineer.

READS WIRELESS MESSAGES FROM EARTH CURRENTS

A Philadelphia man has devised a receiver which he attaches to a plow in such a manner that when the plowshare is buried in the earth, and with telephonic receivers at his ears,



Plowman in Communication with Wireless Station through Ground Currents

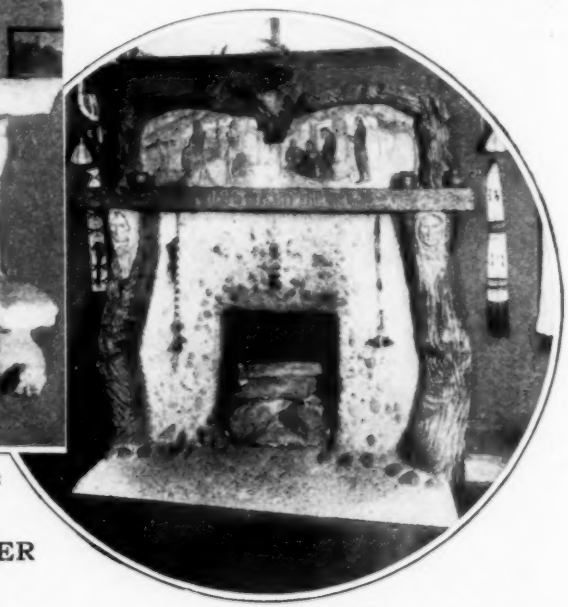
he can hear wireless messages perfectly, the powerful wireless apparatus at League Island being distinguished easily.

This portable receiving device may be attached to wagons or such other vehicles as permit perfect ground connection. The contrivance may be utilized in war to advantage, as it makes aerial antennae unnecessary under favorable conditions.

A Crude Fireplace of Stone and Cement Built in Imitation of Pioneer Workmanship for a Log-Cabin Den

MANTELS IN OLD PIONEER STYLE

Antique woodcraft fireplaces of a design that recalls the early pioneer days in Ohio are being built in many Cincinnati homes. The materials—logs, stones, and Indian trinkets—are secured from neighboring forests and streams by a woodcraftsman whose purpose is to reproduce the simplicity and crudeness of pioneer workmanship. One of the mantels shown in the accompanying pictures was built entirely of stone and cement to stand in a log-cabin den. The lettering and the tableau picture of the pioneer, going through the woods with his dog, and prairie schooner, were molded in soft cement with a crude instrument to imitate unskilled workmanship. The oil lamp and antique trinkets and the old-fashioned pictures on either side add to the effect of crudeness. The more elaborate fireplace for a drawing-room has pilasters and moldings of gnarled logs set in the cement just as they came from the woods. A bas-relief of a peace meeting between Miami Indians and early settlers, and two stone portraits of Miami braves increase the impression of antiquity. The boulders and logs were taken from the banks of the Little Miami River and the arrow heads and other implements were dug out of Indian mounds in the same valley.



A More Elaborate Antique Mantel Decorated with Gnarled Logs and Indian Relics

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¶ A ferry boat for carrying trains across the Florida Strait from Key West to Havana, Cuba, has been ordered from a Philadelphia shipbuilder. This boat will be 350 ft. long, with a beam of 50 ft., and is estimated to cost $500,000.

Only One Passenger Fatally Hurt in This Accident, Where Steel Cars Saved Many Lives

HOW THE STEEL CAR SAVES LIFE IN DERAILMENT

Withstanding the terrific shock of overturning while speeding, the steel cars recently placed on a western railway line proved their worth, as out of more than 200 persons aboard only one was killed and 20 slightly injured. Four cars were completely overthrown, but, aside from broken glass and displaced trucks, were but little worse for the accident and could be hauled back on the rails. What would have happened to old wooden cars under similar circumstances may easily be imagined.

MONUMENT TO TWO "TITANIC" HEROES

A low granite pedestal supporting a bowl of Tennessee marble, from which rises a simple rectangular shaft, stands in the grounds immediately back of the White House, commemorating the tragic death of Francis D. Millet and Maj. Archibald W. Butt in the "Titanic" disaster. Water supplied from four jets in the form of globes flows over the edge of the basin in a veil. Around the brim is inscribed: "In Memory of Francis Davis Millet, 1846-1912, and Archibald Willingham Butt, 1865-1912, this monument has been erected by their friends, with the sanction of Congress." Designed by Daniel Chester French in collaboration with Thomas Hastings, the memorial is a classic. A fund subscribed entirely by intimate friends of Major Butt and

Fountain to Art and Chivalry in Memory of the Artist, Frank D. Millet, and the Soldier, Maj. "Archie" Butt

Mr. Millet covers the cost of construction, the sculptor and architect dedicating their labors to the cause.

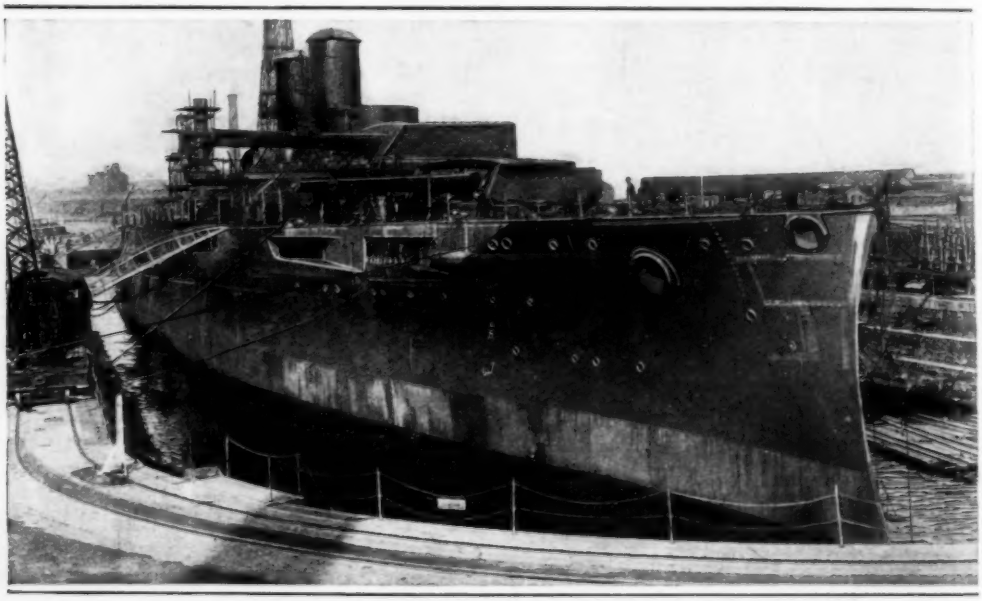
¶Thirteen hits out of a total of 15 bombs was the record made by the winner in the competition for bomb throwing from aeroplanes, recently held in Paris, France.

MAKING THE TROLLEY POLE ORNAMENTAL

Among the many designs submitted to the authorities of San Francisco to improve the appearance of their streets for the annual Portola celebration, the ornamentation of trolley poles shown in the illustration found favor. In an ornamental ironwork bowl, placed midway up the pole, plants, vines, ferns, and palms are grown, which garnish the thoroughfare and make sightly the prosaic supports of wires and electric lights. Flags and banners may also be added, and the design lends itself to any decorative scheme.

MOST FORMIDABLE FIGHTING SHIP EVER BUILT

In the New York Navy Yard workmen are busy completing the "New York," the great sea fighter which will carry the heaviest armament yet known on a man-of-war. Five hundred and seventy-three feet long, with a breadth of 95½ ft., the "New York," displacing nearly 28,000 tons, is expected to make at least 24.18 miles an hour. The main battery consists of ten 14-in. guns, so placed that all can be fired in a broadside at the same time. The weight of the projectiles thus thrown would be 28,000 lb. or 14 tons of metal at one discharge. The ship will carry a second battery of twenty-one 5-in., and ten smaller guns for torpedo defense. There are also four submerged torpedo tubes. A crew of 1,200 officers and men will be necessary to operate this big fighting machine, which is fitted with turbine engines and carries a coal supply of 2,850 tons, besides 400 tons of oil. The engines are rated at 32,000 hp. A sister ship, the "Texas," carries the same armament.



Latest Addition to the Navy of the United States, Now Nearing Completion in the New York Navy Yard

ROBBING THE DESERT OF ITS MENACE

By LOU WESCOTT BECK

[Here is a story of an unusual humanitarian work, told with characteristic modesty by the man who did it. It took months of persuasion to induce Mr. Beck to describe for us his efforts to make travel in the Southwestern desert safer, but the result is this intensely interesting recital.—The Editor.]

THE one thing of supreme importance in the desert is water. The inexperienced traveler quickly learns this fact. To the experienced prospector who has spent the greater part of his life in the desert and has endured all its hardships, who has encountered on numerous occasions the dead bodies or bleached bones of men who have fallen victims to heat and thirst, a realization of the greatest menace of the desert—lack of water—is brought home with terrible force. The so-called "American Sahara," in which hundreds of men have lost their lives, is a great desert region covering about 70,000 square miles, located mainly in southeastern California, but extending into Nevada, Arizona, and Mexico. This region includes Death Valley, the Funeral Mountains, Furnace Creek, the Cactus Flats, and many other less known but equally desolate sections. It is not the gold hunter alone that is lured to his death in the desert. The geologist and lover of nature find it a fascinating treasure vault. Adventurous men will continue to go into the desert, and they will continue to die of heat and thirst unless a way is provided for guiding them in case of necessity to the scanty supplies of water that exist in these barren wastes. It was with such realization of the desert's dangers as came from sixteen years of prospecting, and following a nerve-racking experience of his own, that the writer undertook the task of placing in all parts of the desert signs that would guide the lost traveler to the nearest water.

The wells, springs, and "tanks" of the desert are from 35 to 50 miles apart. Much of this scanty supply is unfit for use, many of the pools and wells being poisonous. A well, unused for a long period, becomes a catch basin for the alkalies of the soil, while snakes, lizards, kangaroo mice and other animals may fall into it and add to the contamination. It is just as important to warn travelers against poisonous or contaminated water as it is to guide them to good water.

The work was undertaken by the writer from humane motives, but the actual work of exploring the desert and placing the signs became a hard practical question accompanied by a great deal of danger. At first the outfit consisted of a covered wagon drawn by a good, strong team of mules, but this proved unsatisfactory on account of the necessity for carrying a large amount of feed and water for the team. Then a 20-hp. automobile was secured, and this has been used in the work for the past three years. This car, the "Chuckwalla," has penetrated to parts of the desert formerly thought to be inaccessible except with burros, and has made one trip to the lowest point in Death Valley, 480 ft. below sea level. The car is stripped to the last pound and is fitted with extra tanks for gasoline, oil, and water, and with all equipment for living in the desert. To protect them from the intense heat of the desert, where the mercury often goes to 120 and 130 deg. F., the tanks are covered with heavy asbestos paper, over which canvas is securely fastened.

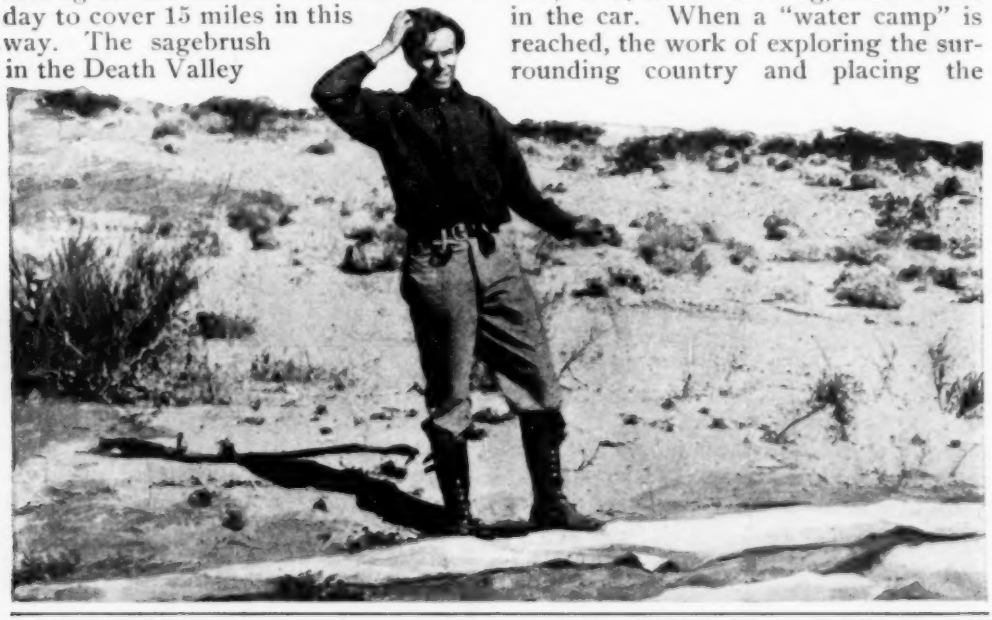
A good idea of the equipment of the car is given in the illustrations. The two tanks back of the seat are for gasoline and hold 32 gal. Between the seat and the gasoline tanks is a water tank holding 4 gal., and in addition to this supply, 3 gal. of drinking water is carried in canteens. In front of the seat and resting on the floor is a long, flat tank holding 4 gal. of lubricating oil. When starting on a trip an additional 15 or 20 gal. of gasoline is taken in 5-gal. cans, which are buried at various points along the route to be picked up for use on the return trip. The box at the rear of the car is made to telescope, the rear half sliding into the front half. This box, when extended and supported by uprights at the corners, forms a bed 6 ft. long.

For protection against the wind and the night cold of the desert, a canvas cover, fastened to the box with carriage buttons and supported at the peak by socketed uprights, is erected over the box. When traveling, provisions, signs, "war bag," and clothing are carried in this box. Even the running boards of the car furnish valuable space for storage. The sleeping bag and the ever useful long-handled spade are strapped on the right-hand running board. On the other running board is a box, 4 ft. long, 14 in. wide and 12 in. high, divided into two compartments, one for cooking utensils and the other for the camera outfit. The lid is on the side and is hinged at the top, and when opened up and supported by hooks it becomes a dining table.

It is an easy matter to travel down grade in the shifting sand, but the return trip is slow and difficult, and would often be impossible without some way of making a "roadway" for the car. For such cases, four strips of canvas, each 30 ft. long and 3 ft. wide, are carried. These are laid down successively ahead of the car, care being taken at each pause to leave the car resting on the canvas. It takes a full day to cover 15 miles in this way. The sagebrush in the Death Valley country has a thorn which is liable to tear or puncture the tires. To prevent this the tires are wrapped with several layers of heavy canvas. At many places the sand is too loose and deep for the wheels to secure a grip. To overcome this it is often necessary to wrap the tires with sash cord.

Two kinds of signs are needed in the desert, one to mark the "poison water" and the other to give the direction and distance to good water. These signs are 30 in. long and 8 in. wide and are painted white on the face, with lettering stenciled in black, while the back is painted red or yellow. As only light posts can be carried, the signs are not only firmly set into the ground, but, as an additional protection against the wind, each sign is anchored to a greasewood bush which is first drawn into a tight clump and wired. In the canyons the water signs are painted on smooth rock faces.

In his work in the desert the writer is accompanied only by "Rufus," a Siberian bloodhound which, owing to his crossbreeding, has the nose of the English bloodhound and the intelligence of the St. Bernard. Rufus is provided with an individual "grub box," and, while traveling, has his seat in the car. When a "water camp" is reached, the work of exploring the surrounding country and placing the

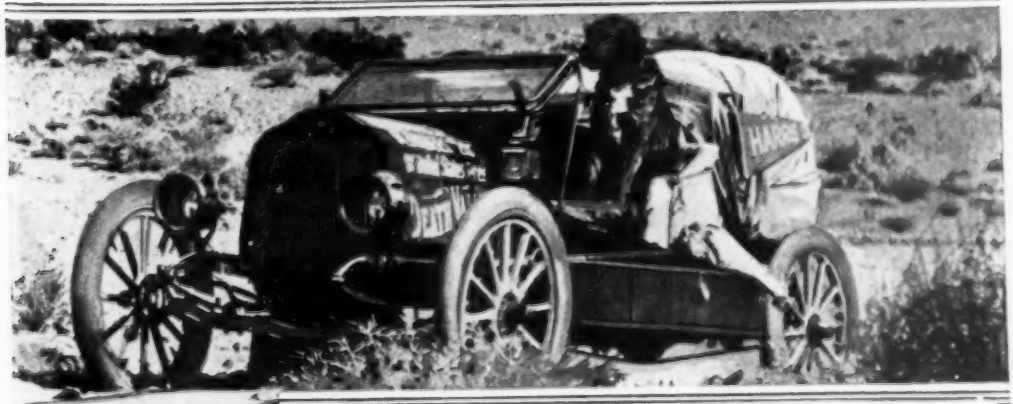


A Water Sign in the Desert

Water Sign Painted on Smooth Rock Face

The Dog "Rufus" Equipped with Saddle Bags and Elk-Skin Shoes. Photograph Made in Death Valley, 350 Ft. below Sea Level

The "Chuckwalla" in Camp, on the Way to the Mojave Desert



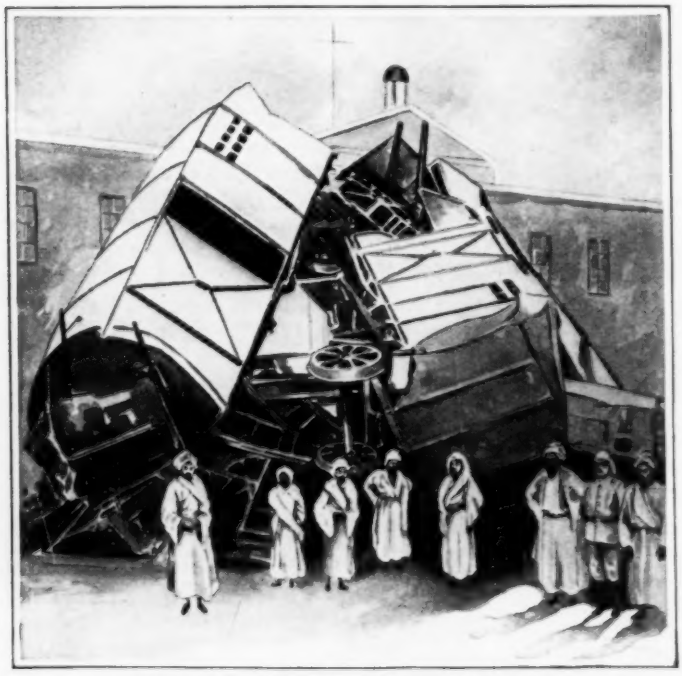
Photos Copyrighted by Lou Wescott Beck, Pasadena, Cal.

Using the Canvas Strips to Get Out of a "Wash" in Death Valley

water signs is carried out mainly on foot, since much of the country is impassable for a vehicle of any kind. While this work is being done, Rufus wears saddle bags containing dog biscuit for his own sustenance, canteens filled with water, and a camera case in which are restoratives for heat and thirst victims. His feet are protected from the hot sand by elk-skin shoes secured in place by lacing about the ankles. The dog's nose is an infallible detector of bad water, and in many other ways the aid of this mute assistant is of such a nature as to be indispensable.

RAILWAY SMASH AT CAIRO PILES CARS HIGH

A wreck occurred last summer at Cairo which resulted in a spectacular piling up of cars, as shown in the photograph. The train was traveling at between 25 and 30 miles an hour and crashed into some stationary cars on a siding, owing to a misplaced switch. No fatalities resulted, but the cars were turned on end, and piled one above another in remarkable fashion.



Wreck of Train in Egypt Leaves Cars in Air

¶Exactly 1,052,208,000 eggs, worth $21,441,160 at wholesale, were in storage in 45 warehouses in the United States on July 1, 1913.

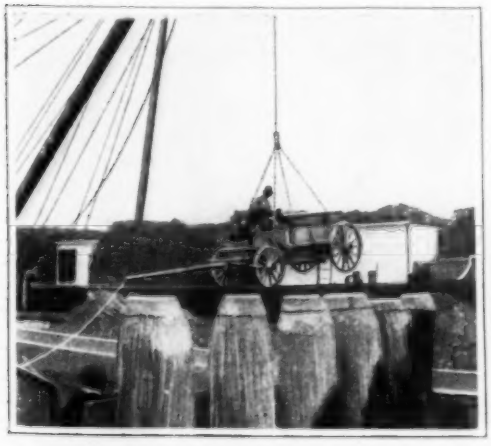
SOCIETY FOR PRESERVATION OF HISTORIC RECORDS

A society has been formed to preserve to future generations the faces and forms, the voices, actions, and gestures of the great men of today by means of phonographic records and moving pictures. It is the belief of the promoters of this organization that the people of 50 years hence will be as interested in hearing and seeing President Wilson, King George and Kaiser Wilhelm, for example, as we would to hear the very accents of Lincoln in his Gettysburg address, or Washington, as he delivered his "Farewell to the American People," or to have preserved in absolute fidelity the expression, the tone, the sweetness of Jenny Lind, the "Swedish Nightingale," whose singing entranced our grandparents. It is the purpose of this society to preserve forever in fireproof, burglar-proof and earthquake-proof vaults, master films and records of men and women of today who are concerned in events of moment. From these master records, other films and other records are to be produced from time to time, as may be necessary, to keep in memory great events and the story of our times. An endowment is sought sufficiently large

to insure the erection of a great receptacle, the employment of proper custodians, and the reproduction of records. It is believed that history recorded in this form would be vital and shown in true perspective without prejudice or caricature, and that the moving spirits of the age would desire to speak their message to future generations. Phonographic records have already been made of many great speakers. Recently 3,000 persons listened to the voice of John Alexander Dowie at Shiloh Tabernacle, Zion City, as a phonographic record of a sermon delivered by him 11 years ago was reproduced, five years after his death.

SHORT-CUT DUMPING USED IN LOADING BOATS

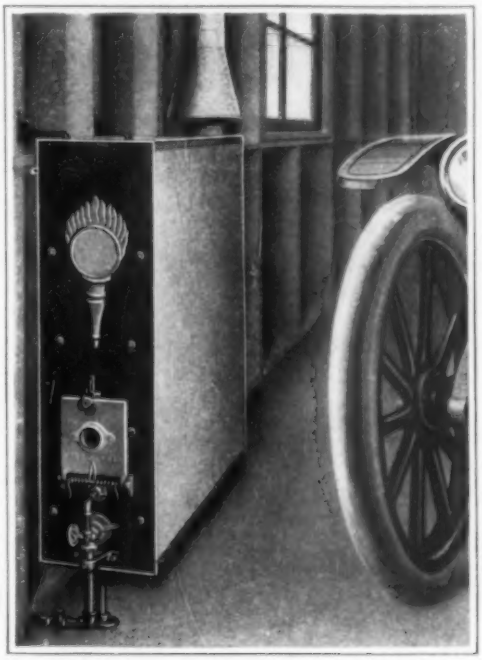
Short cuts in efficiency are being woven into everyday affairs until such commonplaces as loading garbage scows show the effect of the efficiency campaign. In one of the Detroit River ports a jib crane picks up a loaded wagon and swings it bodily over the scow, while the driver sits in his seat and operates the dumping lever. In the meantime another wagon is being unhitched, and when the empty wagon is returned to the ground, the horses are again hitched up, the crane picks up the next wagon, and the process is repeated.



Novel Method of Dumping Wagons

A SAFE HEATER FOR USE IN GARAGES

The advent of cold weather brings with it grief for the owner of an auto who has not yet brought himself to see the economy of heating his garage.



This Simple Gas Heater Keeps Jack Frost Out of the Garage

There has been put on the market recently a safety garage heater which is built on the principle of the miner's lamp, and cannot explode even when gasoline fumes are heavy in the garage. Either artificial or natural gas may be used in this heater, which is only 9 in. wide, 38 in. high and 40 in. long. It is mounted against the wall on brackets, warm air is discharged at the top and the sides do not get hot at all. An auto may be placed right next to it without danger of blistering. A pilot light which never goes out takes care of the heater, and all the garage owner has to do is to turn the gas valve for more heat. It is economical in operation and affords protection from winter troubles, such as frozen radiators and water jackets, gummy oil and starting difficulties.

MARKET-BASKET SWING FOR THE BABY

A swing for the baby, designed for use on porches or in the house wherever most convenient, is made of a

Baby Swing Made from a Market Basket

good-sized market basket, suspended, by chains attached at each corner, from hooks set into an archway or ceiling. It is abundantly strong for safety, and may readily be taken down when not in use. It is so simple that anyone can construct it, and will not tip over, no matter how violent the motion.

MUST KEEP FREEZER WARM IN ALASKA

Alaskans eat ice cream in the winter even more than in their short summer. When the thermometer ranges at 60 deg. below zero, there is little trouble in freezing the cream, the main difficulty being in keeping it warm enough. For this reason the ice-cream freezer has its regular place beside the stove in well-regulated Alaskan kitchens.

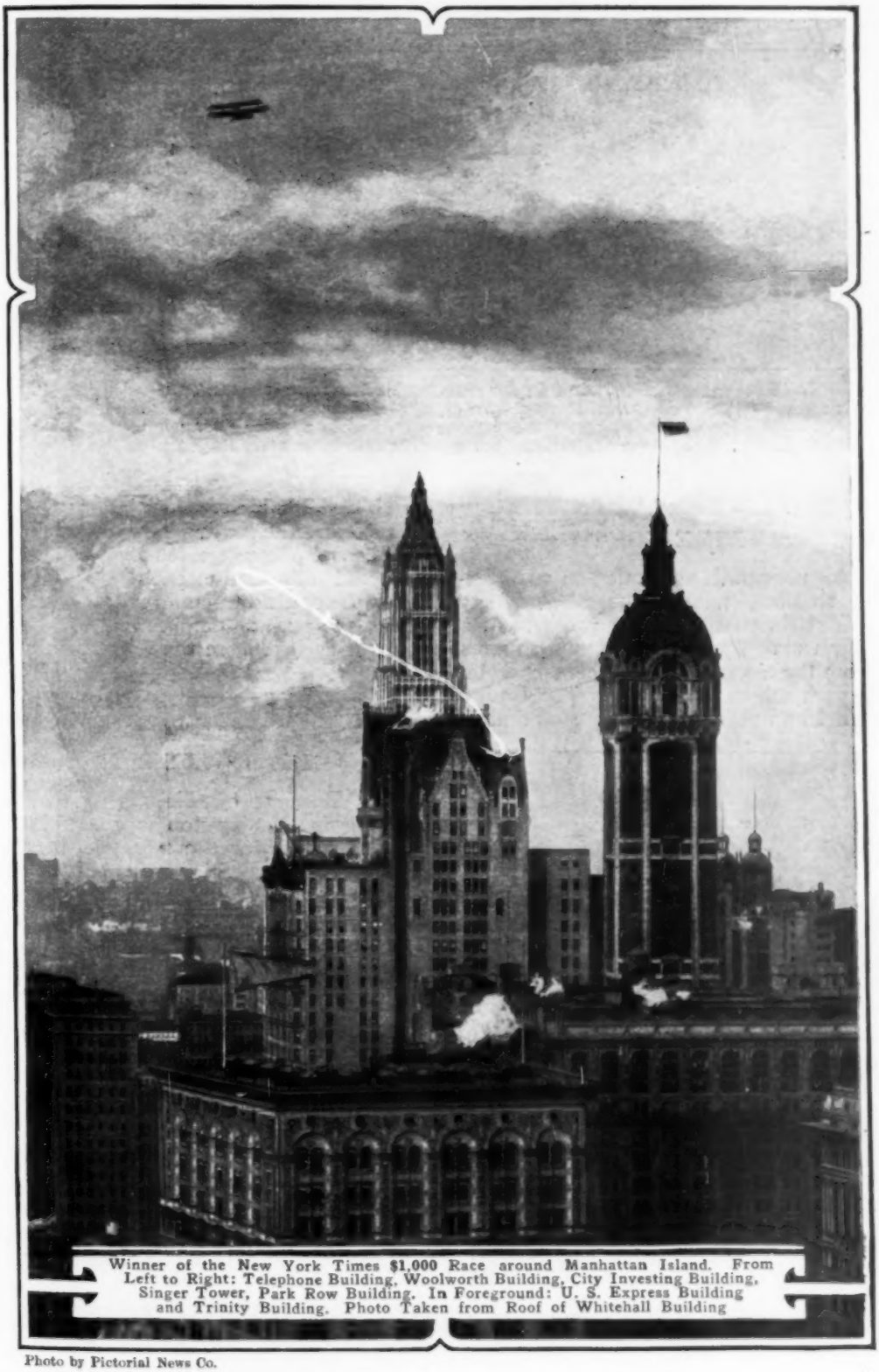
NEW INSULATING AND RUST-PREVENTING CHEMICAL

A new insulating and rust-preventing material, known as "paracit," has been brought out in Germany. This material is said to possess extreme resistance to chemical influences of all kinds. It is an efficient electrical insulator and is neither cracked by heat nor split off by fatty acids. Paracit coatings, to be dried in the air or in an oven, are applied to metal objects by brush, immersion or spraying methods, and if the material is intended to stand high temperatures it is subjected to heat treatment. Such coatings are being used not only to resist acids, alkalies and atmospheric influences, but are being applied successfully to boiler tubes to protect them from the corrosive action of the water.

RETIRED BUSINESS MAN WINS AEROPLANE RACE

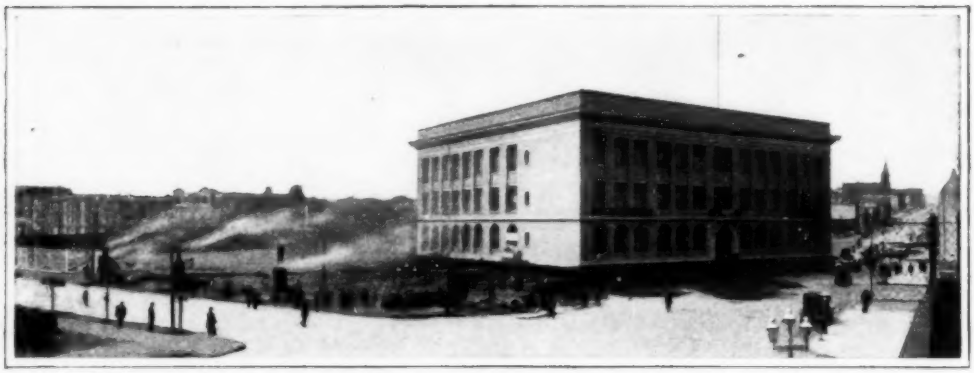
A retired business man, William Luckey, won the New York Times aeroplane race around Manhattan Island recently, in a gale which ironed out the flag on the Singer Building like an old-fashioned shirt bosom. Maintaining an average speed of more than 70 miles an hour, Luckey was in the air just 53 minutes and 6 seconds, and during that time he flew some 60 miles.

Just about a year ago this old-young man, who had been for years engaged in business in New York, approached the aviation field as a student. His face had the resigned expression of the tired business man, and his hair was streaked with gray, but in nerve, determination and courage he was surpassed by none of the younger crowd, and his exploit, in the face of a chilling gale, is remarkable. When he finished he was so stiff with cold he was unable to arise from his car and had to be lifted to the ground and supported to shelter. His machine was a Curtiss biplane and behaved admirably in the stiff wind. The prize offered to the winner was $1,000.



Winner of the New York Times $1,000 Race around Manhattan Island. From Left to Right: Telephone Building, Woolworth Building, City Investing Building, Singer Tower, Park Row Building. In Foreground: U. S. Express Building and Trinity Building. Photo Taken from Roof of Whitehall Building

Photo by Pictorial News Co.



In the June, 1913, number of Popular Mechanics Magazine, page 824, the story was told how a San Francisco High School, three stories in height and weighing 8,000 tons, was being moved a distance of two blocks, three engines working as a "team" supplying the motive power. This picture shows the building being swung into place after its journey.

SMALL HAMLET IN THE LIMELIGHT

An unorganized hamlet on an interurban line, near Kansas City, has solved its street-lighting problem in a new way. The town lies two squares from the electric line and is reached by a path which crosses a rustic bridge and leads through a tangle of underbrush and boulders. At night pedestrians found the footing very uncertain, when some one suggested that lime be scattered along the pathway. This was done and now the streak of white makes the path as definite and certain at night as if it were the Great White Way.

Sprinkling Rustic Path with Lime Makes Way Clear in Darkest Night

VAULTS PROTECTED WITH LIVE WIRES

The Bureau of Engraving and Printing in Washington is constructing five vaults for the storage of old plates, outside of which wire will form a network of 6-in. square mesh. The wire will be charged with electricity for protection. The vaults will contain plates used in printing postage and internal-revenue stamps, and currency. Any tampering with the vaults will be automatically detected. The estimated cost of construction is $110,000.

RAPID TELEGRAPH ADOPTED BY GERMAN GOVERNMENT

The new rapid-telegraph system recently developed in Germany has been adopted by the imperial administration and has been installed on the busy lines between Berlin and other German cities. The transmitting machine has a keyboard similar to that of a type-

writer and can be worked without difficulty by any typist, while the message is recorded in perforated writing on a tape by the receiving machine. Both the transmitting and receiving machines ordinarily make 120 revolutions per minute, transmitting one character at each revolution, but in order to adapt the work to the electrical conditions of the line the speed may be increased to 1,000 or reduced to 200 revolutions per minute.

SELF-LIGHTING LAMP FOR USE IN GOLD MINING

Working underground, man is always at a disadvantage, dependent upon lamps, which place him at the mercy of gas and dampness. Gold miners and those whose activities in the interior of the earth do not demand the protection of a Davy's lamp are given the opportunity of using an acetylene light fastened on their cap, which dispenses with the use of matches. A bit of some pyrophoric or light-producing alloy such as used in automatic cigar lighters, is held by a setscrew against a wheel, which may be revolved by drawing the hand rapidly across its milled edge, producing sparks which ignite the gas issuing from the burner jet.

STORAGE-BATTERY CAR FOR ALASKA NARROW GAUGE

On the Tanana Valley Railway in Alaska, a narrow-gauge line, a storage-battery car is in use. Under traffic conditions none the best, this vehicle climbs the grades, swings around curves and delivers the goods to the wonder and amazement of the miners and prospectors, many of whom have not been out of Alaska for years.

Storage-Battery Car Which is in Everyday Service in Alaska

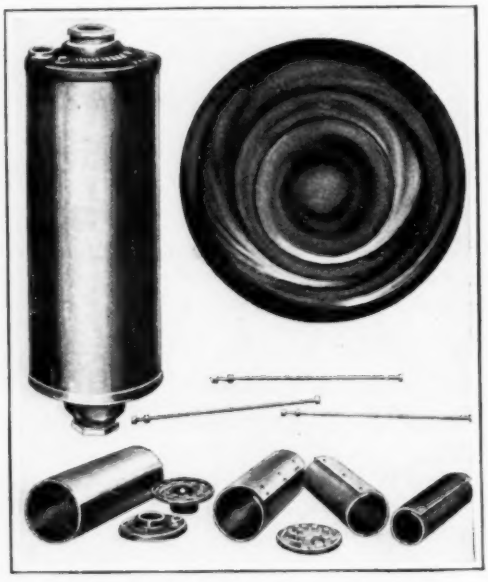
FIELD GUNS IN ACTION SHOWING RECOIL

Powerful as small field pieces are in sending their heavy projectiles thousands of yards distant, it is true that action and reaction are equal, and the recoil even of so small a piece as a 3-in. gun is tremendous. The camera caught one of these guns at the instant of discharge, and shows very plainly the powerful recoil, the gun showing far to the left of its position at rest.

This Shows How a Field Piece "Kicks" When Fired

MOTORBOAT SILENCER OF NEW TYPE

A motorboat silencer that has just been brought out is designed to give the exhaust gases, as they pass through



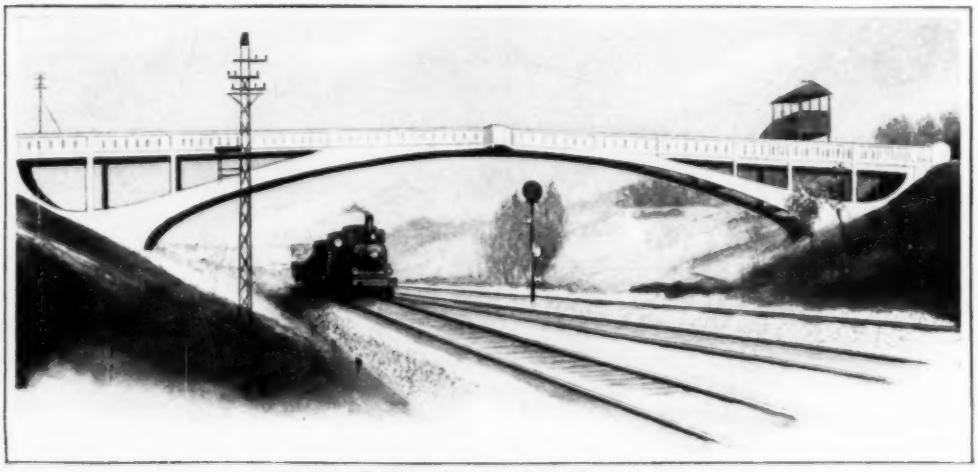
Inside View of Motorboat Silencer Showing How Gases are Given a Whirling Motion

it, a whirling motion, and thus dissipate their energy without interposing any resistance to their movement or causing any back pressure on the engine. This silencer has been developed as the result of much scientific investigation and experiment in which it was discovered that the engine exhaust, like the discharge from a gun, consists of two separate noises, one of which is caused by the sudden expansion of the exhaust gas and the other by the first rush of gas from the exhaust port. Both noises, it is credibly reported, are effectually silenced by the use of this device. For using the silencer successfully it is necessary to have it of exactly the right capacity for the engine exhaust. It is made of a new alloy, consisting of nickel, iron and copper, which has the strength of steel and at the same time a remarkable resistance to corrosion.

CAST-IRON REINFORCING FOR CONCRETE BRIDGE

A reinforced-concrete bridge in which cast iron is used for reinforcing was one of the objects of interest at the recent International Building Exhibition at Leipzig, Germany. This bridge has a span of 148 ft. and carries a roadway over the four-track railroad that passes through the grounds.

Aside from the lightness and architectural beauty of the structure, it is interesting because of the novel type of reinforcing used. The bridge is simply a cast-iron structure with an envelope of concrete. In building, the cast-iron



Concrete Bridge with Cast-Iron Reinforcement

The Machine | Tree Planting with Machine | Old Way of Planting with Three Men

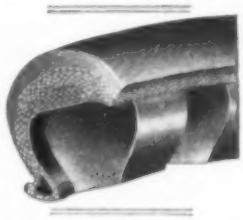
members were first covered with a layer of concrete which was tightly wrapped with wire, and an outer layer of concrete molded into architectural form was then applied. Tests have shown that the rigidity of the cast iron is overcome by inclosing it in a concrete envelope, and that the bridge has the elasticity of a steel structure combined with the resisting qualities of concrete. This system is used only in the span members, the floor being of the usual reinforced-concrete type.

TREE-PLANTING MACHINE SAVES TIME

With a tree-planting tool designed by a Utah blacksmith, the hole is dug, the little tree inserted and the earth packed around the roots in one operation. The implement consists of a bar with a crossarm at the top and three blades of spring steel at the bottom, somewhat on the principle of the post digger, and having a lever near the lower end. The lever is pressed with the foot, the tree inserted, and the tool is then thrust forcibly into the ground. A lever at the top of the handle is then twisted to open the blades and the implement is screwed around in the hole until the soil is pulverized. The planter is then withdrawn, leaving the cultivated earth packed around the roots of the plant. Experiments made by the U. S. Forest Service have shown that one man with this tool can plant 50 small trees in 35 minutes.

AIRLESS TIRE BUILT LIKE BRIDGE

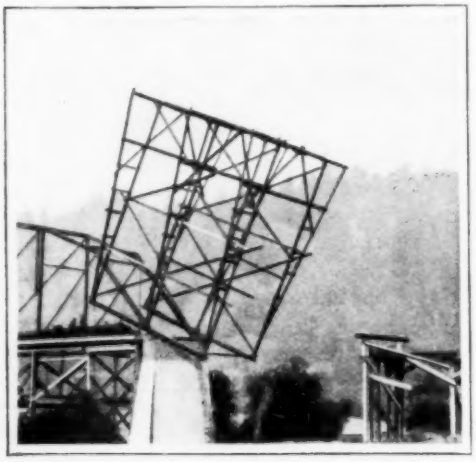
An airless tire has been constructed of piers or spokes of rubber and an annular ring or rib of straight-cut fabric and rubber, corresponding to the beams of a bridge or the felloe of a wheel. When the airless tire strikes an obstruction the stone sinks down into the tire, rubber is displaced and the pier or column of elastic rubber squeezes down and bulges out into the open spaces between the piers.



About 2,000,000 tons of scrap steel are used every year in America.

QUICKLY WRECKING DERRICK SAVES MONEY

When the erection of a 350-ft. span was completed the traveling derrick



Traveling Derrick Dumped into River When Job was Completed

was quickly disposed of by running it off the end of the completed span. The salvage value of the material of which the traveler was constructed was less than the labor cost of dismantling it, and for this reason the contractors decided it was cheaper to wreck it than to save it.

ASBESTOS DEPOSIT FOUND IN NATAL

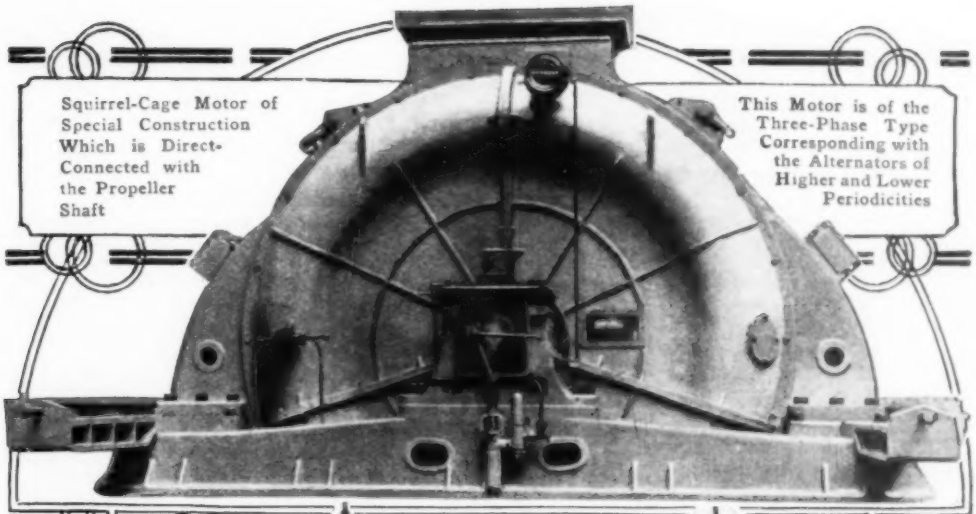
An extensive asbestos deposit has been discovered in the western part of Natal, South Africa. The ground in which the deposit is found is an oblong plateau, about two miles wide and four miles long, situated near the Klip River. The veins at the outcrop are from 12 to 14 in., but widen rapidly, and at a depth of 12 ft. below the surface have a width of about 24 in. One vein exposed to a depth of 30 ft. measures 4 ft. 9 in. in width. It is believed that the working of these deposits will add enormously to the world's supply of asbestos, most of which has heretofore come from Canada.

ELECTRICALLY PROPELLED SHIP "TYNEMOUNT"

An innovation in marine construction is the electrically propelled ship "Tynemount," recently built in Glasgow, Scotland, for service on the Great Lakes of America. The "Tynemount" differs in no respect in appearance from other boats of similar class. It is 250 ft. long and 42 ft. in breadth, and will carry 2,400 tons of cargo. But in economy of space taken up in boiler room and bunkers in ordinary installation, the saving is large.

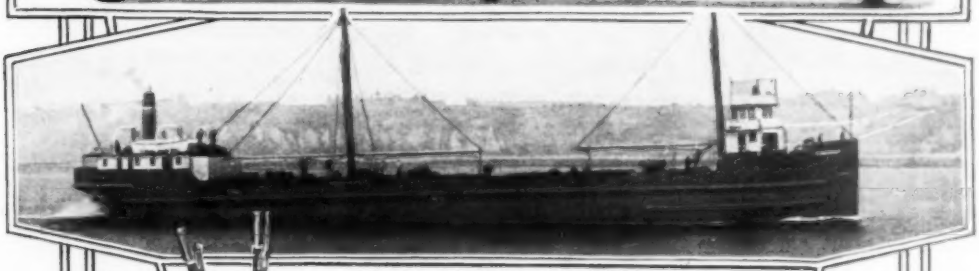
The propelling machinery consists of two 6-cyl. Diesel oil engines of 300 hp. each. To each of them is direct-coupled a three-phase alternating-current generator. The power of both these generating sets is led into one three-phase motor of special construction, which is direct-coupled to the propeller. The peculiar feature of the electrical system is the use of alternating currents of two different cycles, one alternator having eight poles and the other six. The motor is provided with two different windings, one adapted to the higher and the other to the lower periodicity, and when both these windings are used the motor runs at full speed, and the highest speed of the ship is attained. In order to reduce the speed of the motor without reduction of the engine speed the connections are altered so that one generator and one motor winding only are in use.

The advantage of an electric drive is that it forms such a gear ratio between the engine and the propeller that each of these may run at its most efficient speed. Thus for the most efficient running a comparatively low propeller speed is usually required, while steam, turbine or interior-combustion engines do their best work at high speeds. If the propeller is direct-connected to the engine or turbine, a compromise between these speeds has to be made and the combination runs at a speed which gives reduced efficiency for both engine and propeller.

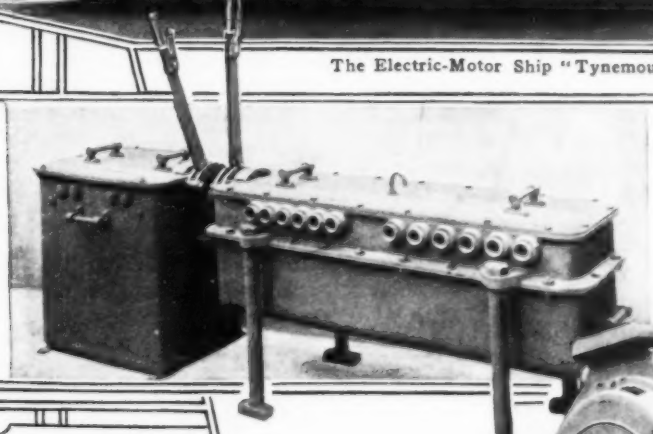


Squirrel-Cage Motor of Special Construction Which is Direct-Connected with the Propeller Shaft

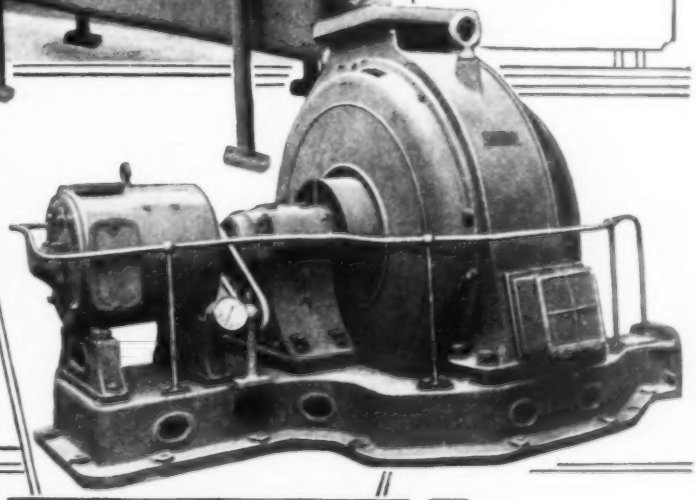
This Motor is of the Three-Phase Type Corresponding with the Alternators of Higher and Lower Periodicities



The Electric-Motor Ship "Tynemount"



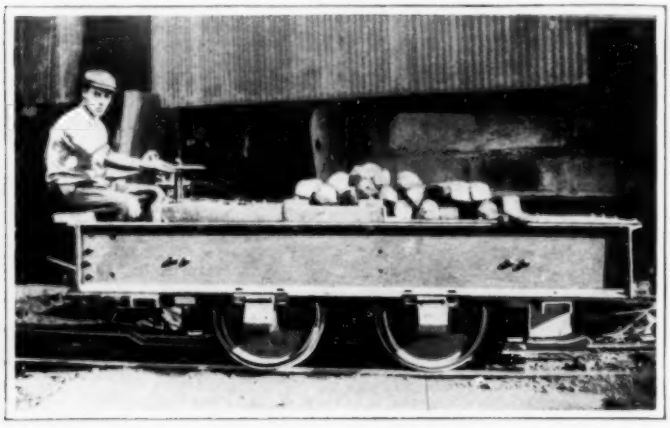
Main and Exciting Switches with Interlocking Gear, by Which the Necessary Changes for Altering Speed of the Vessel are Made



One of the Three-Phase Alternators, Running at 400 Revolutions per Minute. One of These Alternators has Six Poles and the Other Eight. By Means of This Difference of Periodicity the Control System has been Worked Out

SURFACE-CONTACT SYSTEM WORKS WELL

A traction system in which electrical contact is made by means of shoes beneath the motor car to boxes placed at suitable distances between the tracks, is in operation in a Pennsylvania steel plant. The boxes in the center of the track are "dead" until energized by a device beneath the motor, and then, on contact, they give electrical impulses to the motor, dying again when contact is past. Thus the tracks are always safe, no electrical power is lost, and short-circuiting from pieces of steel bars dropped in carrying, or from flooding the tracks with water, is unknown.



Motor Which Picks Up Power from Boxes between the Rails

FREIGHT TRAIN A MILE LONG

An engine of the Erie Railroad established a record recently, when it pulled a train of 102 cars of first-class freight from Port Jervis, N. Y., to Jersey City. It was assisted up the mountain to Guymard, N. Y., by three mogul pushers, but the rest of the way, over the low grade, the one engine sufficed. The train was a mile in length.

¶An English company with $9,650,000 capital has been granted a permit to develop 600,000 hp. from Norwegian watercourses.

SELLING OLD BATTLESHIPS AT AUCTION

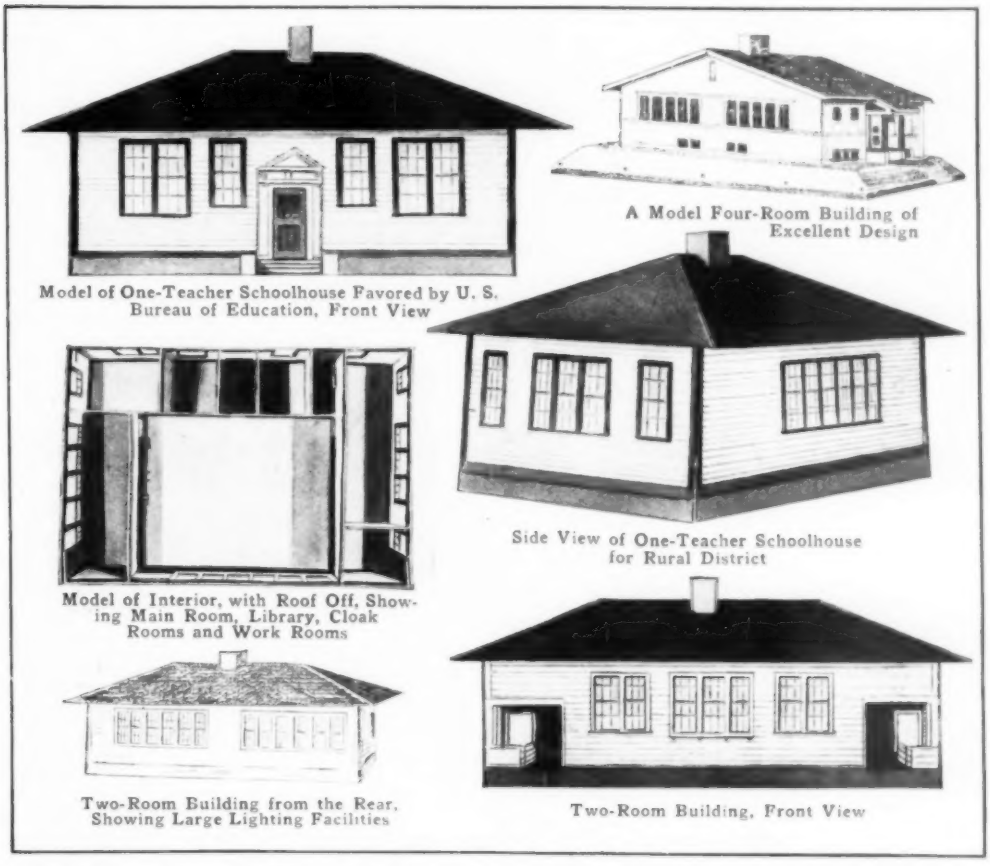
Something new in merchandizing was shown recently when the British admiralty held a sale at Portsmouth and offered a number of discarded cruisers to the highest bidder. For the "Ramillies," formerly flagship of the Mediterranean squadron, and the "Royal Sovereign," once Channel-squadron flagship, costing some $5,000,000 each, bids of $211,000 and $230,000 were accepted. The cruiser "Melpomene" went for $79,000, the "Pandora" was knocked down for $45,000, and several submarines, the first built for the British navy, brought but $1,800 to $2,050 each. In some cases the ships will be rebuilt and used as merchantmen, while in others they will be dismantled for the value of the materials.

IRRIGATING RICE FIELDS IN OLD JAPAN

Last summer the rice fields of Japan experienced a severe drought, and in many cases total losses would have been suffered without the primitive irrigating system shown in the illustration. The wheel is portable, and the farmer places it wherever he sees the most water, and he then runs on the wheel until the water is exhausted. At night he puts the wheel on his back and takes it home, in order that it may not be stolen. The paddles run in a channel from which the water is lifted to an elevation above the rice field.

SCHOOLHOUSE MODELS BY PARCEL POST

There are 212,000 rural schoolhouses in use in the United States, few of which were planned with any regard to light, heat, ventilation, or sanitation. The United States Bureau of Education is planning to change all this, and is sending to rural communities in which there is a movement for new schoolhouses, pasteboard models of one, two, and four-room schoolhouses designed by experts and giving pupils proper conditions for study. The models are correct as to scale, and give full information as to details, cost, and construction work. With the model at hand any competent carpenter can build a full-size schoolhouse and be sure the result will meet the high standards of health and efficiency demanded by the times. It is believed these models will be of great help to school authorities in small communities who cannot afford to engage a school architect and yet are anxious to have their schoolhouses up to date.



Model of One-Teacher Schoolhouse Favored by U. S. Bureau of Education, Front View

A Model Four-Room Building of Excellent Design

Side View of One-Teacher Schoolhouse for Rural District

Model of Interior, with Roof Off, Showing Main Room, Library, Cloak Rooms and Work Rooms

Two-Room Building from the Rear, Showing Large Lighting Facilities

Two-Room Building, Front View

THE PROPER INFLATION OF AUTOMOBILE TIRES

A pressure in pounds equivalent to 17 or 18 times the cross-sectional diameter of the tube measured in inches is the proper inflation for the front tires of an automobile, while the rear tires should be inflated to a pressure 20 times this diameter, according to the rule given out by the manager of one of the tire companies. In a 4-in. tire, for example, the pressure should be about 70 lb. for the front tires, and about 80 lb. for the rear tires.

MAKING NEW PAVEMENTS OUT OF OLD ONES

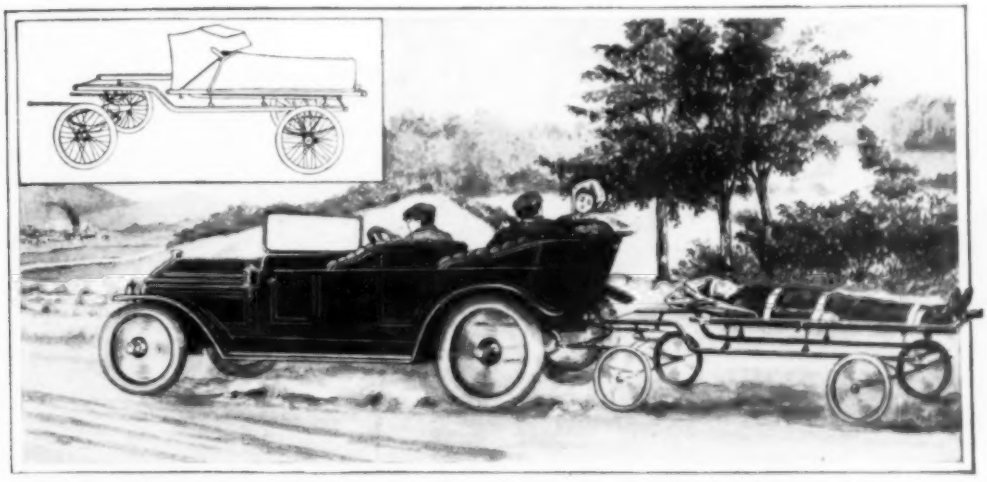
Many miles of old granite-paved streets, worn and furrowed by years of traffic, are being transformed into fine automobile thoroughfares, as smooth as table tops, by the simple expedient of filling the interstices with concrete grouting, and flowing semiliquid cement over the paving. Instead of the old method of treating street surfaces with a tar mixture, Cincinnati has rejuvenated old pavements, worn by 15 years' heavy travel, until they are in fine condition to withstand heavy traffic for an indefinite period. The transformation is worked by thoroughly washing out the crevices between the old granite blocks with a stream of water; then filling all cracks with a grout of cement and sand, and, after this has set, covering the entire surface of the street with a thicker mixture, all excess of the mixture being carefully scraped off, leaving the paving as smooth as a floor, and as hard as a rock. The advantages of a grouted street are that it outwears other pavings; is economical, sanitary, and safe, for horses do not slip on it as on asphalt, wood block or brick, and it can be cleaned with a minimum of expense and time.

Washing Out the Crevices between Old Blocks

Grouting Old Street Which has been Thoroughly Cleaned

Putting on the Finishing Coat of Cement

¶ The parcel post is being extensively used by the Eskimos of Alaska for shipping furs direct to the States.



A Trailer Ambulance Which can be Attached to Any Motor Car for a Quick Trip to a Hospital; Above, the Ambulance Covered for Bad Weather

MOTOR-TRAILER AMBULANCE FROM SOUTH AFRICA

Where roads are not above reproach and a regular ambulance is not always available a trailer has been designed which can be attached to any ordinary car, which is thus converted into a motor ambulance. A power company of South Africa is using this handy attachment in its stations from 7 to 40 miles from Johannesburg. The injured person may be strapped to the light frame of the trailer, the springs of which are very easy, and a cover adjusted to shield the entire body, as protection from sun, rain, or dust.

WIRELESS EQUIPMENT FOR AEROPLANES

The use of wireless apparatus on aeroplanes has been the subject of an exhaustive series of experiments by the United States government, with the result that a compact apparatus weighing only 75 lb. and having a radius of 30 miles has been developed. The generator used has an output of ⅛ kw. and is driven from the flywheel of the aeroplane motor. A hanging form of antenna is used and this part of the equipment can be wound up on a reel and placed out of the way when not in use.

UNIQUE WARNING AGAINST EXCESSIVE SPEED

An automobile driven at a high rate of speed once failed to negotiate a turn on the Point Loma boulevard at San Diego, Cal., and crashed into a trolley pole, breaking the pole and tearing down several hundred feet of trolley wire. The electric-railway company erected another pole at the same place, leaving the stub of the broken one in the ground. As a warning against too rapid driving, the electric company has placed on the new pole a significant sign reading: "Warning to Joy Riders. Slow Down to 100 Miles per Hour." As an additional hint that excessive speed is dangerous, the sign bears a hand pointing to the stub of the broken pole.

METAL SILOS EFFECT BIG SAVINGS

Using a noncorrosive galvanized metal, an Ohio concern is building metal silos which are strong, durable

Silos Made of Metal Show Superiority

and rigid, withstanding the varying elements of all seasons, and cannot dry out or crack. Actual tests have shown that these silos preserve a far larger proportion of the contents in usable condition than even the best wooden ones. Metal silos are neat, and while they should be painted every year, the upkeep is low and their life extends over many years. They are simple in construction and can easily be put up by two men, neither of whom need be an expert.

AERIAL TRAMWAY USED TO TRANSPORT SALT

An aerial bucket tramway, 13 miles long, is in operation in Inyo County, Cal., for transporting salt from the beds in Saline Valley to the railroad at Swansea. This installation was completed six months ago at a total cost of about $500,000. It is electrically driven and is divided into five sections, each working independently. The line passes over a summit at an elevation of 8,700 ft. An ingenious feature of the installation is the utilization of the weight of the buckets in descending the west side of the mountain for generating current to help in raising the buckets that are ascending the east side. The capacity of the plant is 20 tons per hour.

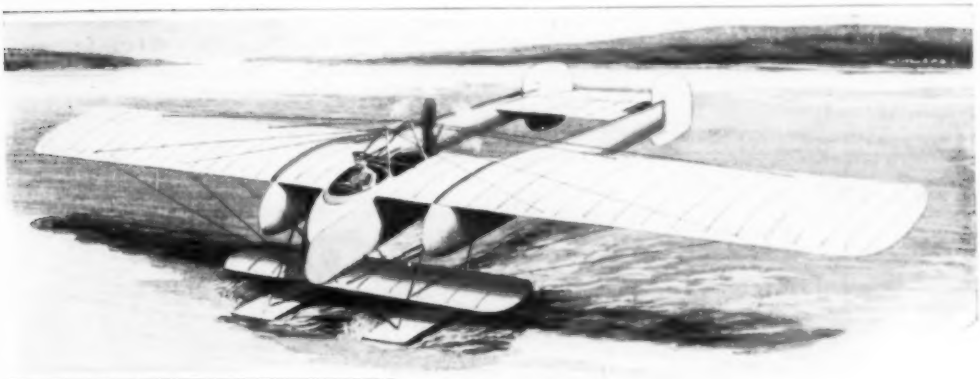
INCLINED HOIST USED BY BERLIN BUILDERS

A new mechanical conveying system for taking the excavated material from a building foundation or cellar and dumping it directly into wagons standing in the street is being introduced in Berlin. The device consists of an inclined track on which runs a four-wheeled truck handled by means of a cable. Buckets of a special type are used for holding the material. These are placed on the truck, as loaded, and hauled to the top of the incline, where they dump automatically through a chute into the wagon. The system is

Photo by Paul Thompson

Mechanical System for Hoisting Excavated Material from Basement of Proposed Building

proving efficient, and requires less power than the vertical hoisting systems commonly used.



Courtesy Illus. London News

Clear View Ahead in Scouting Flying Boat Designed for French Navy

MOTOR BEHIND AIRMAN IN NEW FLYING BOAT

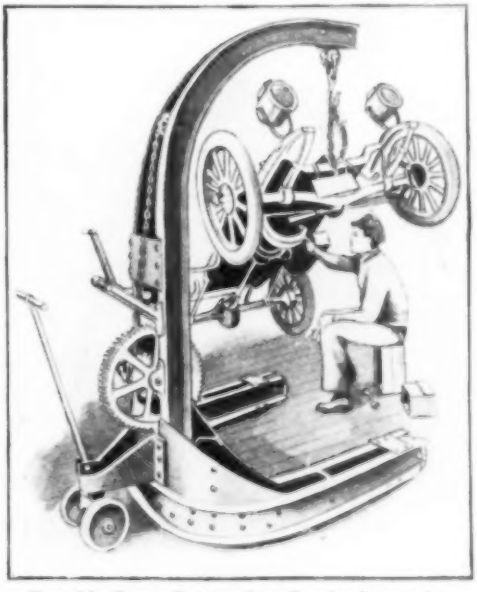
A new flying boat, constructed by a French concern, to carry the pilot and two passengers, is shown in the illustration. The motor is placed behind the pilot, who has a clear view, a very important matter when the air craft is engaged in scouting work for an army or navy. Two rudders add to the ease with which the craft is controlled, and the wide beam assures stability afloat.

COMPRESSED AIR NOW USED IN COOLING DRILLS

When oil is used as a medium for cooling drills in boring deep holes in iron and steel it has a tendency to bind the borings together, so that the drill has to be removed from time to time to clean out the hole. Particles clinging in the flutings of the drill also prevent the oil from reaching the drill point. It has been found that when compressed air is used instead of oil the jet blows out the borings effectively and at the same time cools all parts of the tool and the work, especially if the cutting edges of the drill are so ground that no long chips can form. When air is used a heavy feed is given with slow turning speed, and the resulting hole is as smooth as when oil is used, and the operation is much cleaner.

PORTABLE STEEL CRANE FOR GARAGE

A complete hoisting and conveying machine for the garage is a new portable steel crane for use in inspecting, repairing and rebuilding trucks and automobiles. Easily pulled about the garage by one man, its capacity is great enough to handle, hoist and swing any

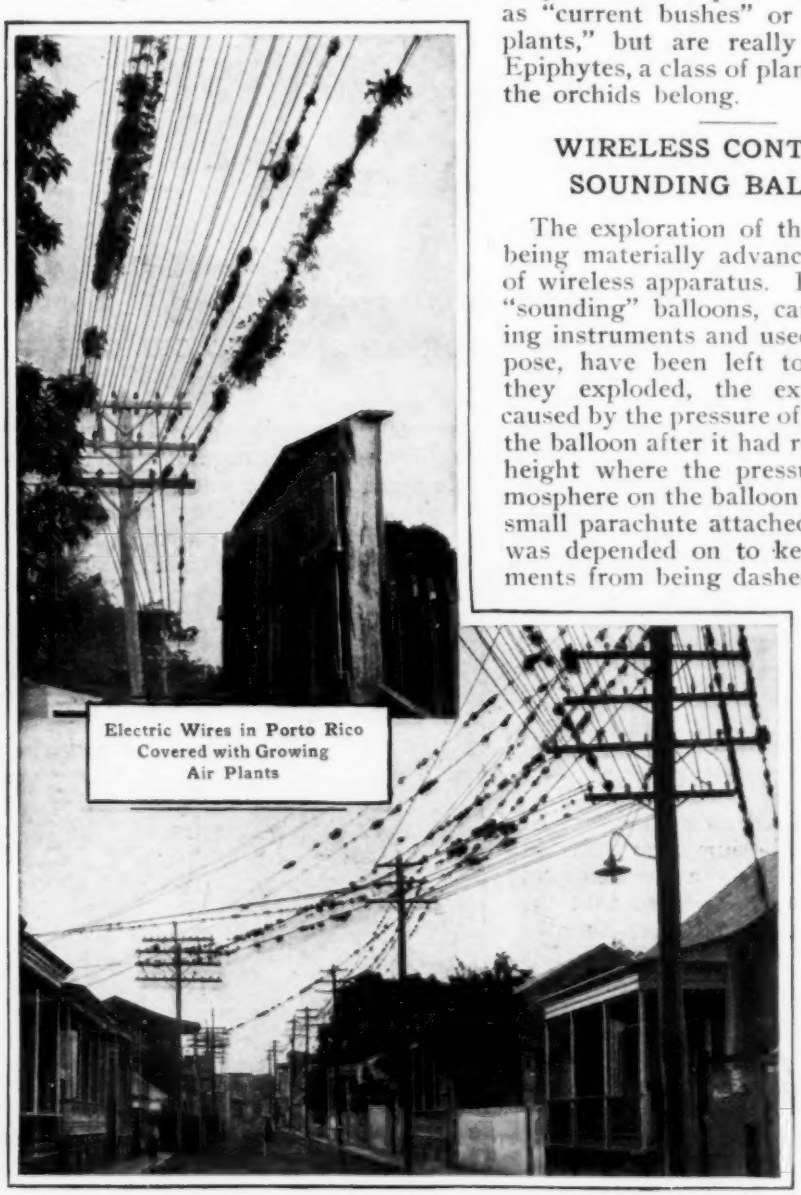


Portable Crane Swings Any Car for Inspection or Repair

size machine, even the largest trucks. The device weighs 900 lb., is 8½ ft. high, and has 3½ ft. overhang.

AIR PLANTS GROWING ON ELECTRIC WIRES

In Porto Rico, where the air is moist and balmy, air plants find lodgment in odd places, none of which attract so much attention from the casual visitor as when they grow on the telephone and telegraph wires. The insulation rots in places and the plants take root, grow and thrive. In Ponce, especially, considerable trouble is caused and new wires are put up in place of old ones, as they are hard to keep clean. Air plants are referred to as "current bushes" or "electric-light plants," but are really a variety of Epiphytes, a class of plant life to which the orchids belong.

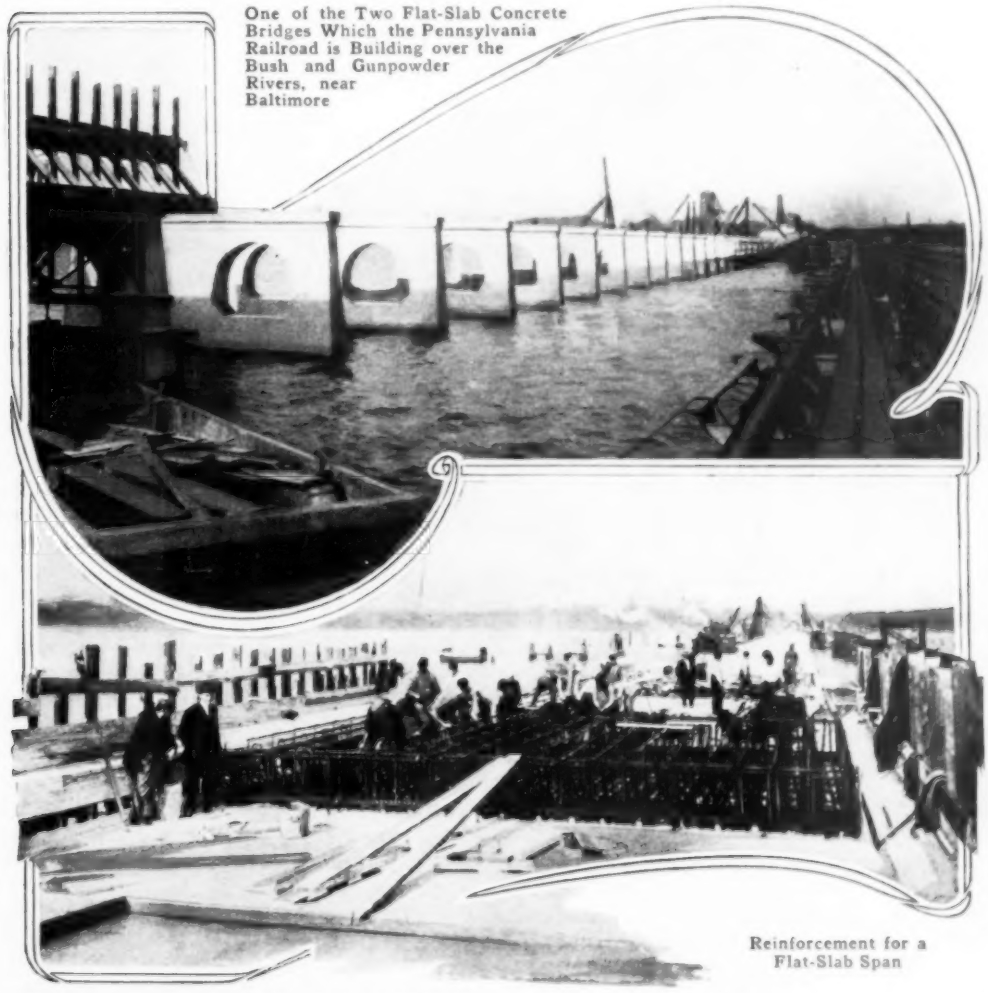


Electric Wires in Porto Rico Covered with Growing Air Plants

WIRELESS CONTROL OF SOUNDING BALLOONS

The exploration of the upper air is being materially advanced by the aid of wireless apparatus. Heretofore the "sounding" balloons, carrying recording instruments and used for this purpose, have been left to ascend until they exploded, the explosion being caused by the pressure of the gas within the balloon after it had reached a great height where the pressure of the atmosphere on the balloon was small. A small parachute attached to the frame was depended on to keep the instruments from being dashed to pieces by the resulting fall. Experiments have recently been conducted at the University of Strassburg with free balloons carrying wireless equipment for opening valves and permitting a portion of the gas to escape when the desired height has been attained. This equipment consists of a wireless receiver which is tuned to receive only waves of a certain length and a relay and magnets which are set in motion to open the valves when

waves of this length are received. The receivers for different balloons are adjusted to different wave lengths, so that each is under a separate control from the sending station, and can be brought back to the earth without disturbing the flight of the other balloons.



One of the Two Flat-Slab Concrete Bridges Which the Pennsylvania Railroad is Building over the Bush and Gunpowder Rivers, near Baltimore

Reinforcement for a Flat-Slab Span

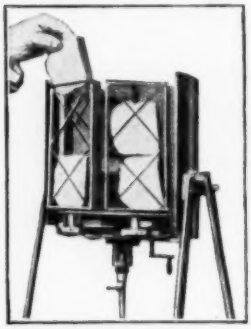
LONG FLAT-SLAB CONCRETE RAILWAY BRIDGES

The longest reinforced-concrete railway bridges of the flat-slab type now in existence are being built by the Pennsylvania Railroad to replace its wooden trestles across the Bush and Gunpowder Rivers, two broad, shallow arms of Chesapeake Bay, near Baltimore, Md. The two bridges, which are only a few miles apart and are being built in the same way, will have a total length of about 1½ miles and nearly 300 spans. The bridge over Gunpowder River will be 4,960.5 ft. long and will contain 189 spans, in addition to the 35-ft. draw span. The Bush River bridge will be 2,675.5 ft. long and will have 103 spans and a 35-ft. draw. Each bridge will be 30 ft. 8 in. wide and will carry two tracks. In construction, the bridges consist of a series of thin reinforced-concrete piers, 26 ft. apart, built on piles driven into the river bottom. Resting on the piers are flat slabs of

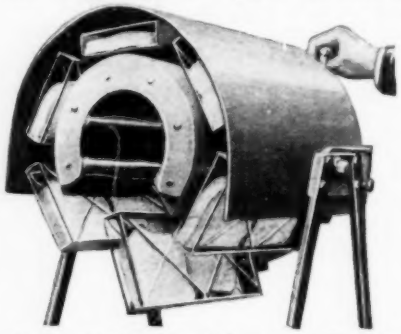
reinforced concrete to carry the roadbed. All the piers except the end abutments have two arches above the water line to make them lighter. Cofferdams are used in building the piers, and the molds for the 26-ft. slabs are supported by short steel trusses resting on falsework about the piers. Most of the work is being done on scows, which carry machinery and transport material, floating in the space between the new bridge and the old wooden trestle, 100 ft. away. About 65,000 cu. yd. of concrete, 13,000 piles, and 4,000 tons of reinforcing steel will be used in the work.

MACHINE FOR TOASTING BREAD

A toaster intended for use in hotels and restaurants which has been placed on the market, has the capacity of toasting 720 slices in an hour. As soon as toasted the slices are dropped into a plate or other receptacle, which does away with the necessity of removing them by hand. In using, the toaster is turned in an upright position and loaded, there being holders for 18 slices. The machine is then turned to a horizontal position and the framework of holders is set to revolving about the central burner. As each holder reaches the bottom position it is automatically turned so that the opposite side of the slice is presented to the burner. When the toasting is completed the device is turned downward and the slices drop into a receptacle. For supplying heat either gas or electricity may be used.



Toaster Turned in Upright Position for Loading



Each Holder is Turned Over as It Reaches the Bottom, Presenting Opposite Side of Slice to the Burner

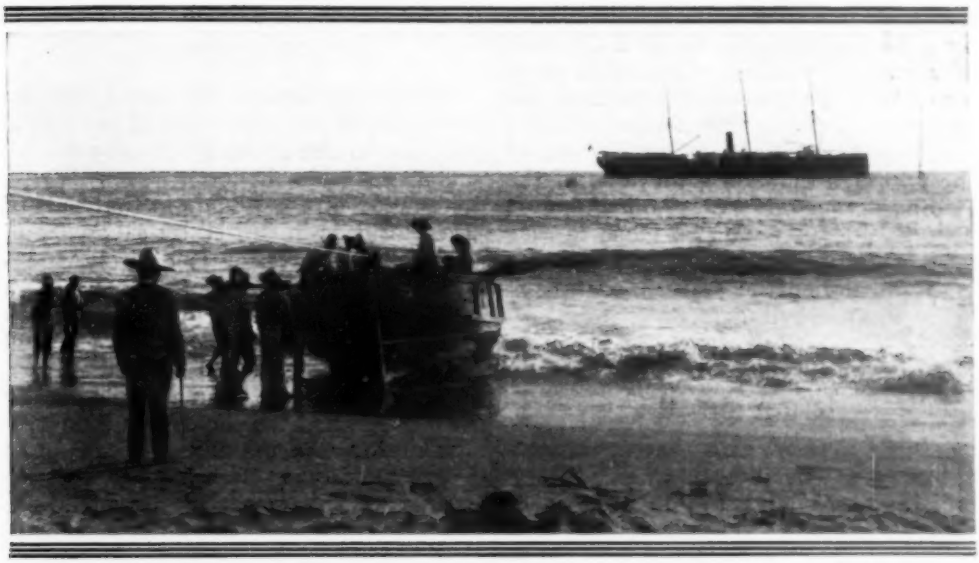
A French airman recently flew 4,406 miles in 67 hours during a series of daily flights covering nine days.

TWO HUNDRED AND FIFTY MILES OF ROAD IN DAY

A remarkable road-building record was recently set in Northern Michigan. In one day a fine gravel road was constructed between Bay City and Mackinaw, a distance of over 250 miles. Fathers, husbands, and brothers labored at digging, plowing, hauling and grading, while mothers, wives, sisters, and sweethearts cooked meals and put new heart into the muscle-weary workers. State officials, mayors of cities and towns, millionaire lumber men, and mill workers, townsmen, and farmers, worked in the hot sun, hewing with picks and axes at corduroy slabs, throwing out stones, shoveling sand and gravel, leading plow horses, or performing other of the many kinds of labor required. All the family horses were at work, so the women walked over country roads to prepare meals for their men. The result of the one day's work is an unbroken line of graveled highway more than 250 miles in length.

CENTRAL AMERICAN COAST LACKING IN HARBORS

Few good harbors are to be found along the coast between Panama and California and in most cases it is necessary for ships to anchor far out from shore and to transfer passengers and freight by means of wide, rather



Landing Ship's Passengers on Coast of Guatemala: Boat is Handled by Means of Cable That Runs Out to Buoy in Deep Water

clumsy-looking rowboats. One primitive but successful method for making the transfer is to have a cable running from the shore to a buoy anchored in deep water and to use this cable in working the boat to and from the ship. A boat handled by this method at a point on the coast of Guatemala is shown in the illustration. Such crude methods serve the purpose fairly well under present conditions, but with the opening of the Panama Canal it is believed that trade along this coast will experience a big increase and that modern harbor and dock facilities will become a necessity.

EIGHTEEN-TON LOCOMOTIVES HAULED BY TRUCK

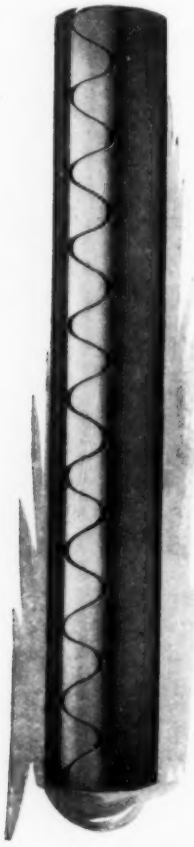
Three locomotives were shipped by rail to a construction company having a job on Staten Island, and were unloaded at Tomkinsville, to be delivered "on the job" at West Brighton. The engines weighed 18 tons each, and were loaded on platform wagons,

Hydraulic Truck Hauling a Steam Engine across Country, the Load Being 23 Tons beside the Ballast

weighing five tons. They were hauled by a 4-cyl. hydraulic truck a distance of about four miles. Grades of from 4 to 12 per cent were encountered, the longest hill being three-quarters of a mile long. An interesting feature of the trip was that, on a hill, one of the priming cups on the gasoline engine opened, and in trying to close it, was broken off. The truck finished the haul and pulled the entire load up the hill on three cylinders.

THE HARMONIC FRACTURE OF A TUBE

What is known as a "harmonic fracture," the wavelike line of cleavage which appears when a tube of perfectly uniform structure is subjected to endwise pressure, is illustrated by the manner in which a tube made of a new insulating material split under such a pressure. The material in the tube was a hard, tough composition, remarkable for its uniformity and homogeneity of structure. When the tube was held firmly on a metal mandrel and a compressive force was applied at one end, the line along which the tube split was an almost perfect sine wave. The uniformity of the wave proves that the material was absolutely homogeneous. If any part of the tube had been stronger or weaker than the rest, the strain would not have been uniform and the wave would have been distorted. The cut was made from a photograph.



NEW GUINEA TO BE EXPLORED BY AIRSHIP

Plans are being completed for the exploration of the island of New Guinea, in the South Pacific, by means of a dirigible balloon. This island, like many of the islands in that part of the world, is inhabited by savages and most of the interior is entirely unexplored. The airship is to be built from designs made in Berlin, and is estimated to cost about $750,000. It will be 320 ft. long and 60 ft. in diameter, will be able to rise to an altitude of over two miles, and will be driven by a 100-hp. motor at a maximum speed of 34 miles per hour. The base of the exploration will probably be at Malu, where a portable shed and gas-generating plant will be set up. From this point flights will be made over the island to other points on the coast that can be reached in one day, and with the aid of such instruments as the aero camera and the photoperspectograph reliable maps of the interior will be made. The work will also include the selection and establishment of stations for land exploration.

LIBRARY OF MOTION-PICTURE FILMS

Films of industrial processes, or of an educational nature, are being contributed by German and foreign film manufacturers to a library of motion-picture films in Berlin, which is designed to serve two purposes. In the morning teachers may bring their classes to see any of the films in the auditorium connected with the library, while the afternoon is devoted to scientific lectures which are illustrated by the films for students attending the higher schools.

¶A system by which the electric lights are automatically switched on when an attendant goes down the steps and switched off when he comes up is in use for saving current in some basements of mercantile establishments.

ELIMINATING EELS BY ELECTROCUTION

There always have been eels in Eel River, a California stream emptying into the sea, but none in Russian River, a near-by watercourse, upon which a water and power company had built a power plant. With the boring of two tunnels through the mountains, however, connecting the two rivers, there came at once a shoal of eels which not only threatened but actually did crowd up into the water wheels until the water backed up and the canals overflowed into the surrounding lands, and the plant could no longer be operated. Investigation proved that the eels did not come through the tunnels, but when some of the water of the Eel River flowed through the tunnels into the Russian River, the eels began to be attracted to the Russian River and swarmed up that river from the sea. Regardless of how they got into the river, the engineers saw they would have to be eliminated, and hit upon the novel method of electrocuting the slim and slippery fish. A number of wires were strung among the eels, a high-voltage current turned on, and several wagon loads of dead eels hauled away. The wheels could then revolve once more, the plant began operation again, and the engineers are watching to see if the plague of eels is abated.

¶ The average area administered by a ranger in the Federal forests of the United States is about 100,000 acres, while in Germany the area administered by a man of equivalent rank is only about 700 acres.

TORPEDO-BOAT DESTROYER IN COLLISION

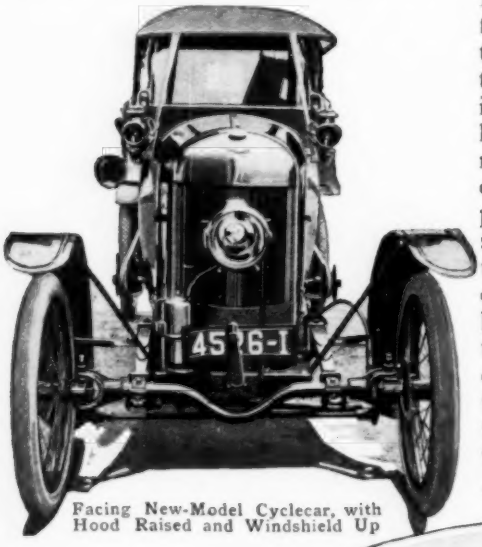
When the torpedo-boat destroyer "Jackal" endeavored to cross the bow of the "Thunderer" during the British maneuvers at Tay Mouth she took a chance which all but resulted in a tragedy. Struck on the port side, the smaller vessel was ripped open by the prow of the dreadnought, but so stoutly was she built that the gaping hole, 16 ft. long, extending below the waterline, did not sink her. The plating was torn asunder like paper, and the destroyer heeled over at an alarming angle. The photograph displays the effect of the blow. The "Jackal" is one of the latest types of destroyer. She is a large and powerful vessel driven by oil, and carries a crew of 80 men.

Photo by Paul Thompson
British Destroyer Rammed by Dreadnought

¶ Japanese lanterns may be prevented from swaying violently in wind by the placing of a few handfuls of sand around the candle holder at the bottom.

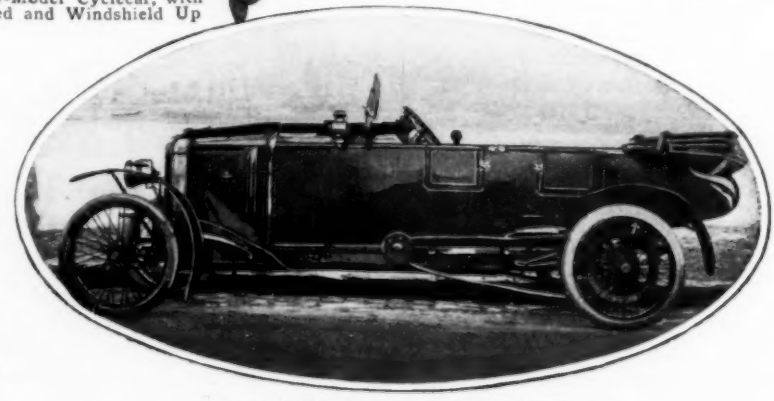
LATEST DEVELOPMENTS IN CYCLECAR CONSTRUCTION

Among the novelties of the 1913 Automobile Salon in Paris, the development of the cyclecar or automobil-



Facing New-Model Cyclecar, with Hood Raised and Windshield Up

ette attracts attention. In France, as elsewhere on the Continent, the excellent roads make these light vehicles popular for extended use. From makeshift expedients the cyclecar has evolved into a recognized type and its salient advantages have won popular favor. The pictures show novel features and pleasing lines. The engine is now fully inclosed. The adoption of fore doors, mudguards and windshields give the protection larger cars afford. So, too, the adjustable top renders the car comfortable in untoward weather.



New Model of Cyclecar Shown in Paris

¶The total amount of gas consumed in New York City in 1912 was 16,927,598,000 cu. ft., valued at $4,866,821.

FIRE IN COAL MINE STOPPED BY MINERS' DRILL

A miners' drill hurriedly welded to the end of a water pipe turned the tide in favor of the fire fighters in a Pennsylvania coal mine, just as the fire had gained such a foothold that there seemed no alternative but to retreat to the surface and flood the workings. The fire was started by a delayed fuse or premature blast, which released some of the slow-burning dynamite, set fire to the wooden supports and then to the loose coal. The situation was particularly bad owing to the proximity of an air shaft and of openings to abandoned workings at higher levels, conditions that were extremely favorable to the rapid spread of the fire. A chute was started through a pillar to reach a point above the fire, but could not be entirely holed through on account of the intense heat. An attempt was then made to drive a water pipe through the remaining obstruction. This pipe was provided with a nozzle pointed like a torpedo and perforated to throw the water in all directions over the fire, but the mass of coal was too firm to be broken through in this manner. On the suggestion of one of the miners, the pipe was withdrawn and to the perforated nozzle was welded a miners' drill carrying three uneven cutting prongs, and with the pipe thus equipped it was easy to force a way through and drown out

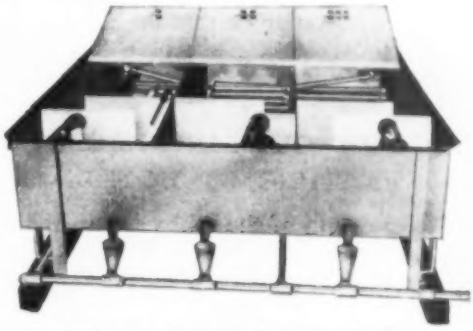
the fire. It is estimated that the use of this simple device at the critical moment prevented a loss of over a quarter of a million dollars.

HOW THEY SHIP WIRE ROPE OVER A MILE LONG

The problems confronting manufacturers of wire cables are various, and not the least of them is that of the transportation of the finished product. This big steel cable was made for a Cuban concern, and the specifications called for 7,810 ft. of steel cable, weighing 123,360 lb. An empty reel was mounted about 200 ft. from the main reel on which the rope had been coiled in the making, and the former reel was then revolved until it had taken a little more than a half of the rope's length. The reel was then moved and another empty reel put in its place. The rope was looped around this reel, so that when it was revolved it took rope in equal lengths from both the main and secondary reels, until one-third of the rope was wound on each of the reels. These were then worked out on the platform, and thence to the cars alongside. The part of the rope between the reels was coiled on the bottom of the cars. When the shipment reached tidewater, cranes transferred the reels into the hold of a waiting freighter.

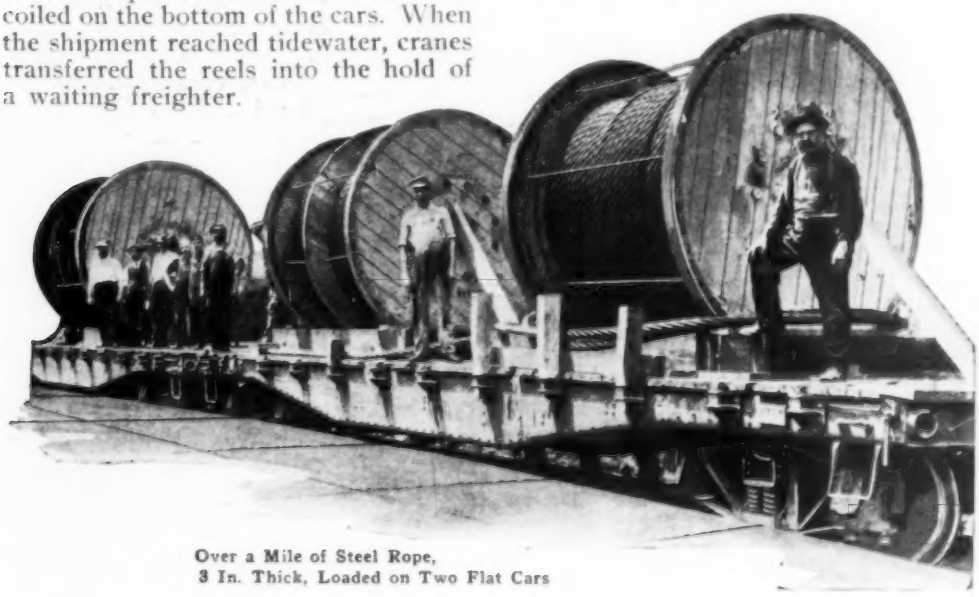
PURE ICE NOW MADE FROM CONDENSER WATER

A water purifier that does away with the necessity of filtering devices of any kind and enables the artificial-ice



Device for Purifying Condenser Water

maker to condense the exhaust steam from his engines and use it for making ice without danger of contamination from oil and other impurities, is one of the latest features in ice-making equipment. This machine consists simply of a series of connected tanks provided with steam pipes for boiling the water, and floating skimmers for taking off the floating oil. The condenser water enters each tank under the steam pipes and is boiled vio-



Over a Mile of Steel Rope,
3 In. Thick, Loaded on Two Flat Cars

lently, a process that serves to separate the oil and sediment from the water. The water then passes between a series of baffle plates that retard the flow and give the sediment time to settle to the bottom of the tank, and then enters a compartment in which a skimmer carried on floats and connected with a drain pipe takes off the floating oil. The water then passes into the next tank where the same process is repeated, and through as many succeeding tanks as may be necessary for purifying the particular water under treatment. The sediment from the water is removed periodically through valves provided in the bottom of the tank.

ENORMOUS FIREPLACES FEATURE OF HOTEL

At each end of the lobby in an Asheville, N. C., hotel are enormous fireplaces constructed of rough-hewn stone quarried from the side of the famous Sunset Mountain. So large are these fireplaces that a double mule team can be driven into them. The fuel used is 14-ft. logs. The fireplaces are in actual use, the gigantic chimneys and huge grates being a most artistic feature, quite in keeping with the architectural scheme employed in the hotel.

Hospitable Hearth of Southern Hotel

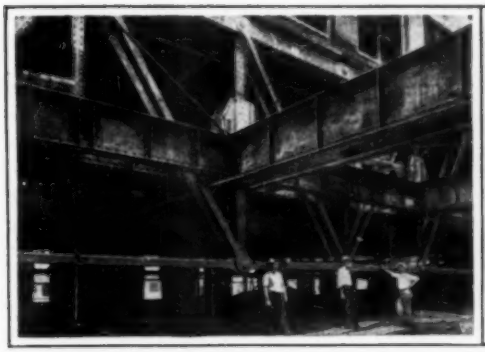
¶Oils distilled from the needles of spruce and fir trees are being used to scent petroleum floor oils and neutralize the disagreeable petroleum odor.

GREAT PEACE EXPOSITION IN LONDON

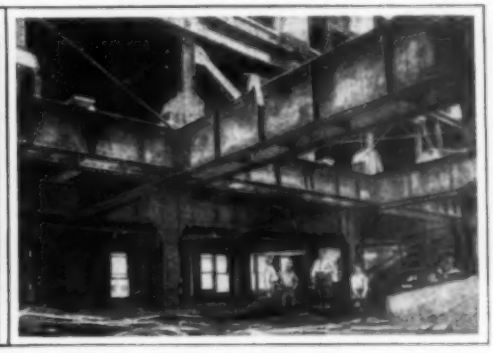
Celebrating the one-hundredth anniversary of the signing of the Treaty of Ghent, and commemorating a century of peaceful progress in the arts, sciences and manufactures, an Anglo-American exposition is to be held in London from May to October, 1914. The exposition grounds at Shepherd's Bush, within 15 minutes from the center of London's main thoroughfare, cover 100 acres. Buildings have been erected to house exhibits in the arts and trades, including a Fine Arts Palace, Palace of Liberal Arts, Congress Hall, Historical Palace, Machinery Hall and Woman's Pavilion. Sports are recognized in a distinct section where, in a stadium seating 100,000 people, athletes will compete for international prizes.

NEW STEEL FRAMING BUILT WITHOUT DISTURBING OLD

A novel method was employed in the work of substituting modern girder construction for the antiquated system of steel trusses supporting the eight stories of the Century Building above the space occupied by the old Century Theater, in St. Louis. The theater auditorium occupied a space 70



New Frame Nearly Completed. The Truss, Which is 1½ Stories High, is to be Removed

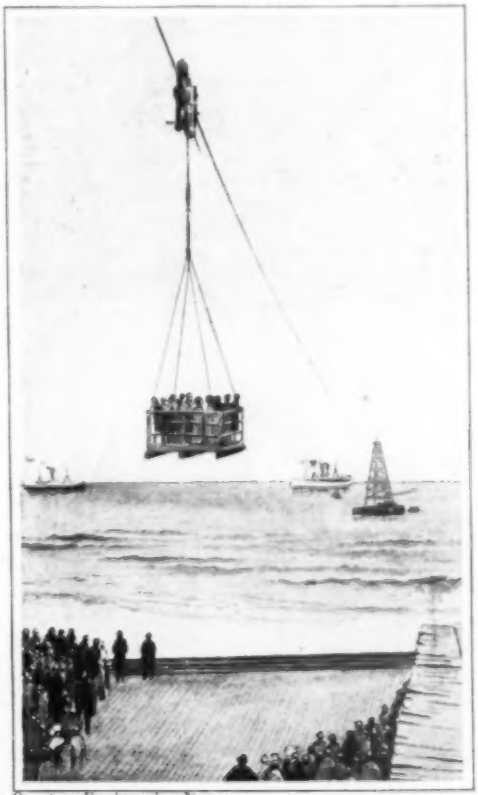


Appearance of Completed Steel Frame after Old Trusses had been Cut Away with Acetylene Torches

ft. wide and 140 ft. long, and had a ceiling suspended from the bottom chords of six steel trusses, each 70 ft. long and 1½ stories high, the bottom chords of the trusses being midway between the fourth and fifth floors. This space was needed for commercial purposes and a rearrangement of the floors and a reconstruction of the steelwork, which supported about 3,000 tons of brick and stone, was found necessary. The new steel frame, containing about 600 tons of steel, was erected inside the theater auditorium from the foundation to the fifth floor and arranged in place to take the entire load, without disturbing the old trusses in any way. When this work was completed the trusses were cut away with acetylene torches and the load was automatically transferred to the new structure. No evidence of deflection could be found after the work was finished. It is estimated that about $80,000 was saved by using this method instead of the usual one of installing temporary supports to carry the building while the change was being made.

CABLEWAY AT NOME LANDS PASSENGERS AND FREIGHT

At Nome, Alaska, the beach slopes very gradually, so that vessels have to lie several miles off shore and land their passengers by small boats or lighters. In on-shore winds the sea is rough and in winter the waters freeze solid for a long distance out. In order to provide a safe landing place a cableway was erected, spanning the distance from the sea tower to a shore tower, 1,400 ft. The shore tower, not shown in the picture, is 125 ft. high and the sea tower is 85 ft. A 2½-in. cable is used and the capacity of the cableway, as designed, is 10 tons.



Courtesy Engineering News
Landing Passengers from Ship at Nome

RARE GAS TO BE USED IN VAPOR LAMPS

Neon, which is an exceedingly rare gas found in the atmosphere in the proportion of about one part to 66,000, is now used in tube lamps similar to mercury-vapor lamps. This gas is a comparatively good conductor, experiments having shown that where 1,000 volts are required for a given electrical transmission in air, 13 volts suffice in the case of neon. The light produced is a bright red, which will hardly permit the use of neon tubes for general illumination without correction with some percentage of blue or violet rays. While the neon tube contains too much red, the mercury-vapor tube contains too much blue. By a combination of the two in one lamp, a light with exactly the color ingredients desired is produced.

¶The new nickel coins of Australia will have scalloped edges to prevent their being mistaken for silver money.

LONDON MOTORCYCLES SHOW DEVELOPMENT

Recent models shown by English manufacturers have sidecar attachments for motorcycles which are far in advance of previous attempts in comfort and convenience. In one the body of the car is covered over and is built to hold two passengers, while the driver sits outside the car. This is an 8-hp., water-cooled motorcycle with three wheels. The simplicity of the American method of concealed controls contrasts favorably with the multiplicity of wires, levers and handles conspicuous on the handlebars of the English model.

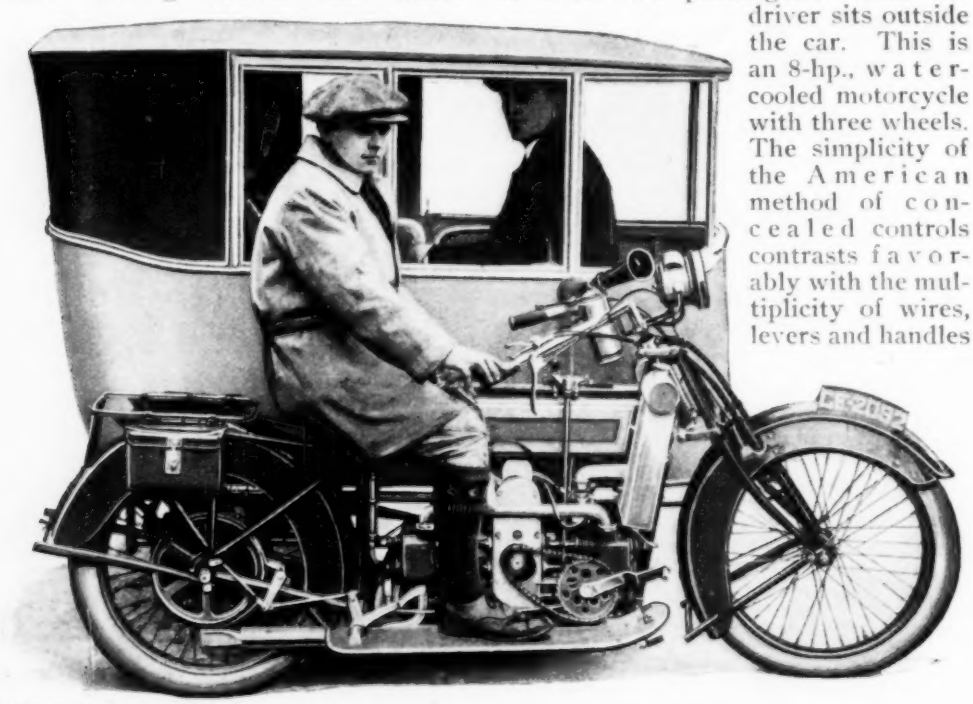


Photo by Underwood & Underwood

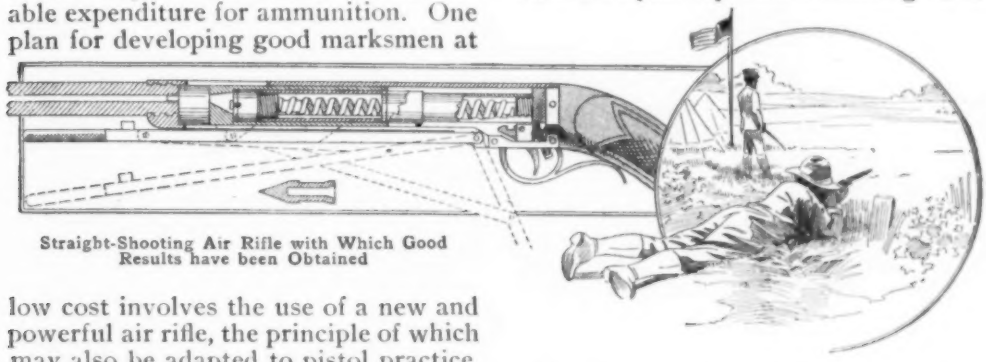
Latest Idea in Motorcycle Sidecars Seen in London

REFRIGERATOR ON WHEELS LATE MOTOR FEATURE

The only refrigerator motor truck so far recorded is in daily use by a sausage manufacturer in Jersey City. The body is specially built along scientific principles and thoroughly insulated. When the truck is loaded cold air is pumped in, and when the temperature reaches a certain point, the doors are closed. The refrigerator truck has proved a decided success.

AIR RIFLE FOR PRACTICE SAVES AMMUNITION COST

Proficiency in the use of firearms comes only at the cost of a considerable expenditure for ammunition. One plan for developing good marksmen at low cost involves the use of a new and powerful air rifle, the principle of which may also be adapted to pistol practice, using a special bullet with which astonishingly good results have been obtained. As seen from the illustration, the new gun has a set-lock or knock-off system which permits the use of a much heavier compression spring than has been used in previous air guns, developing a muzzle velocity of 900 ft. per second. From the fact that crimping the base of the ordinary .22-caliber bullet causes deformities of the base which are fatal to accuracy, the new air rifle uses a special sharp-nosed hollow bullet which is free from this defect.



Straight-Shooting Air Rifle with Which Good Results have been Obtained

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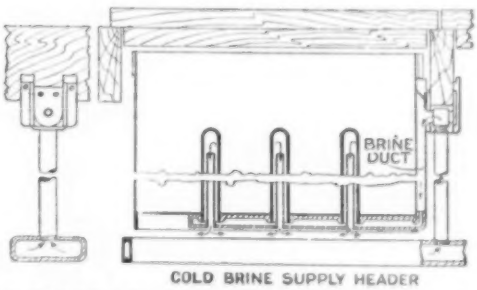
RAPID PROCESS FOR MAKING ARTIFICIAL ICE

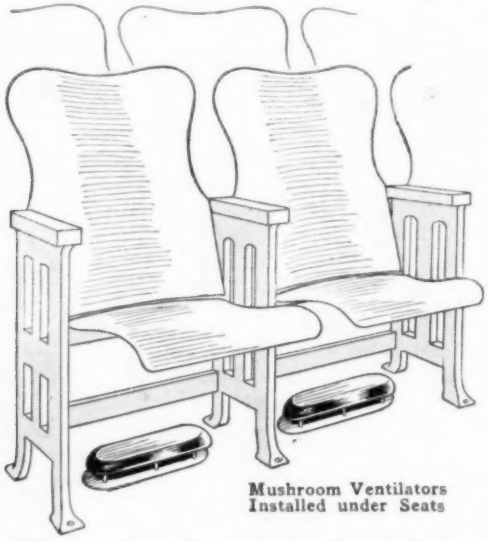
Reducing the time of freezing to about one-fourth that required with the equipment commonly used is accomplished by an ice-making system now being introduced. While this system contains a number of improvements over the old systems, its principal feature is a set of three brine pipes that project upward from the bottom into the middle of the freezing can. With this arrangement the freezing takes place at the same time from the middle of the cake outward and from the outside of the can inward. Not only does this process result in quick freezing, but it seems to prevent the formation of the "core" which is often found in artificial ice. In a 300-lb. can each of the pipes is 1 in. in diameter and is sealed at the upper end, while inside this pipe is a ⅜-in. pipe with an open top and extending to a point near the top of the larger pipe. These are connected with a brine header under the can, which causes the brine to circulate up through the small pipe and down through the space between the two pipes, while the usual circulation of brine is provided around the outsides of the cans. Hooks, hung into the water from the edge of the can, are frozen into the edge of the ice and furnish a means of removing the ice cake. To break the adhesion between the ice and the can the brine is warmed by being circulated through an exchanger containing the warm water for the next freeze, which causes a slight thawing around the edges of the cake and permits its removal. In a recent test of this process 250-lb. blocks of ice were frozen in 12 hours with brine at a temperature of 10 deg. Fahrenheit.



Artificial-Ice Freezer in Which the Process Goes On from Middle Outward

VENTILATION DUCTS UNDER SEATS

Solution of ventilation and heating problems for small theaters and moving-picture playhouses is suggested in



Mushroom Ventilators Installed under Seats

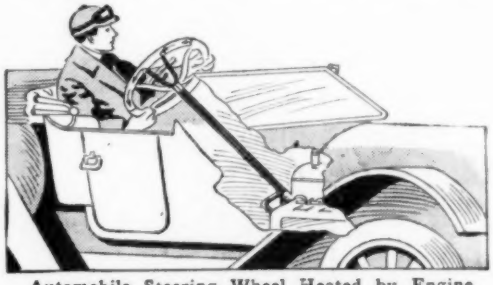
the use of a device recently patented where foul air is drawn from the auditorium through mushroom ventilators installed on the floor under the seats. These ventilators are placed to the right and left of center aisles, six of the ventilators being used under every other row of seats. The ventilators are of cast iron and provided with adjustable dampers giving absolute control of the volume of air and preventing unpleasant drafts. Pure and warmed air is admitted through ducts at the top of the room in winter, and fresh cool air delivered there during the heated term.

TIMBER PRESERVED WITH SUGAR AND ARSENIC

A process for seasoning and preserving timber by means of a solution consisting of saccharine materials and arsenic is extensively used in Australia, New Zealand and India. It is claimed for this process that the sugar and its by-products season the timber rapidly without causing deterioration and that the stable hydrocarbons of the sugar when combined with the arsenic solution prevent the growth of septic organisms and repel all forms of insect attack. The solution penetrates each cell and fissure of the timber without the application of pressure or vacuum. In applying this treatment the timber is placed in closed tanks and the solution, at a temperature of 140 deg. F., is pumped in until the timber is completely submerged, the temperature then being raised gradually to about 215 deg. F. During this stage, which occupies about 15 hours, all the air bubbles and sap juices in the timber are driven off. The absorption of the solution chiefly occurs during the cooling stage, when every interstice in the timber becomes filled with poisoned saccharine matter. It is claimed that timber treated in this way will not develop syrup or crystals, or leach out under any exposure to the weather.

EXHAUST HEATS AUTOMOBILE STEERING WHEEL

A steering wheel that can be heated by the exhaust from the engines of an automobile has recently been perfected. The wheel is of hollow metal with the opening closed at one point by a crosswise metal partition. On each side of the partition is a small opening. To each opening is attached a tube, one tube leading from the exhaust chamber and the other leading through the bottom of the car to the

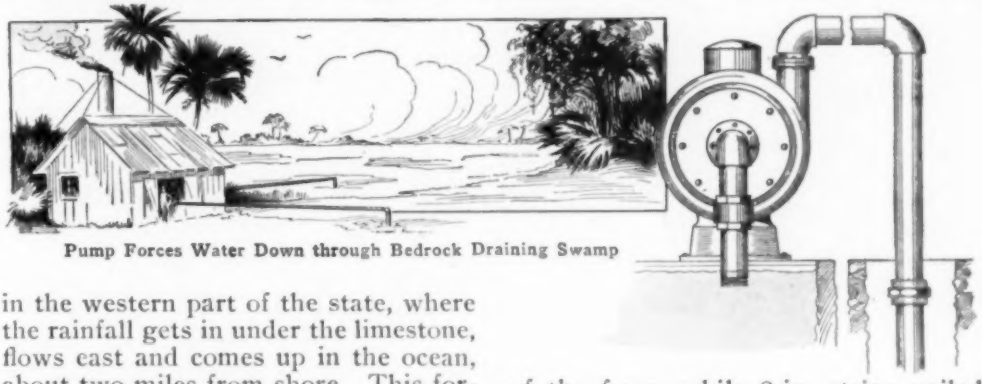


Automobile Steering Wheel Heated by Engine Exhaust. Arrows Show Direction of Flow

open air. By means of a foot valve, exhaust heat from the engine may be driven through the steering wheel as desired.

CLEVER IDEA BASIS OF DRAINING FLORIDA SWAMP

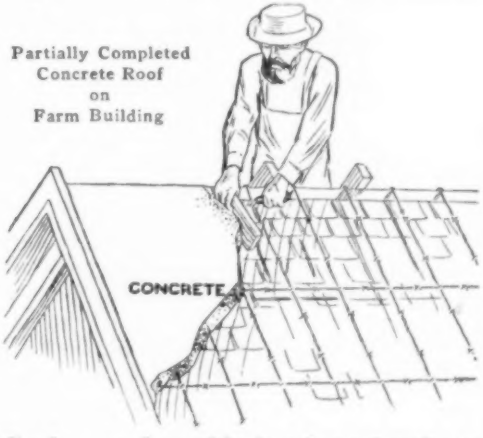
Florida was built upon a coral reef, and this coral is covered with a hard lime rock, which comes to the surface in the western part of the state, where the rainfall gets in under the limestone, flows east and comes up in the ocean, about two miles from shore. This formation gives Florida its artesian wells, with a pressure ranging from 8 lb. at Ft. Pierce to 22 lb. at Jacksonville. A swamp was successfully drained by driving an artesian well, and overcoming the pressure by a gasoline-driven centrifugal pump, the water being forced downward through the pierced rock-bottom limestone, into the water-bearing stratum beneath, and thus outward toward the ocean. In places where there is no surface water and no flow on account of elevation, water will be pumped out from the water-bearing strata for irrigation purposes. The method has been patented.



Pump Forces Water Down through Bedrock Draining Swamp

CONCRETE ROOF REINFORCED WITH BARBED WIRE

A good suggestion for farmers generally is contained in the successful experiment of a Michigan fruit grower in building a reinforced-concrete roof and using ordinary barbed wire as reinforcing instead of resorting to the relatively costly material specially manufactured for that purpose. The building covered in this fashion had a strong and rigid frame, both in the body of the building and in the roof, which was of the gable type, and the concrete was laid directly on the shingles. Barbed wires, spaced 1 ft. apart, were first stretched over the ridge from eave to eave and drawn tight, and other wires, spaced 3 ft. apart, were then stretched lengthwise of the roof. The shingles made the bottom of the form, while 2-in. strips nailed around the sides of the roof made the sides. The concrete mixture consisted of five parts of screened gravel to one of cement, and the concrete was laid to a depth of about 3 in. After being troweled, the concrete was finished with a coat consisting of three parts of sand and one of cement, and later a coat of raw linseed oil was applied to make the surface waterproof. Only insignificant cracks have developed, and these are easily repaired by pouring in a mixture of oil and cement.



Partially Completed Concrete Roof on Farm Building

Such a roof as this is adapted only to cases where the frame of the building is sufficiently rigid to prevent distortion in the heaviest winds.

WATCHMAN'S CLOCK IS PROOF AGAINST TAMPERING

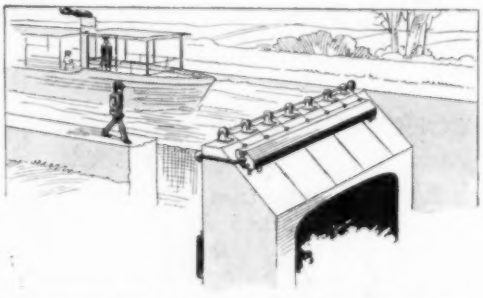
A watchman's portable clock, which seems to be proof against tampering, has been perfected and is operated as shown in accompanying illustration. This type of clock is used by watchmen in registering their visits to the different stations on their beats, a key attached to each station being used for making the record. In this system each key bears a raised number corresponding to the number of the station. When the key is inserted and turned this number is embossed on the paper dial with which the clock is equipped, the result being a complete record not only of the fact that the station has been visited, but of the exact time when it was visited. This is accomplished through a simple mechanism by which the raised number on the key presses the paper into a corresponding female die or matrix.

HIGH-VOLTAGE DIRECT-CURRENT LOCOMOTIVES

Thirty miles of single-track mainline railroad in Montana have been equipped with a 2,400-volt direct-current electric system. This is the first instance in this country in which direct-current locomotives operating on so high a potential are employed. Traffic demands are unusually severe, and consist of hauling long trains of copper ore over heavy mountain grades. Complete freight trains weighing 3,400 tons, made up of 50 loaded steel cars, are handled on grades ruling $\frac{3}{10}$ of 1 per cent, and are handled by a locomotive made up of two units, each weighing 80 tons. These are of the articulated, double-truck type, with all the weight on the drivers. The combination will haul the train at a maximum speed of 15 miles an hour on the grade, or 21 miles on the level track. The passenger locomotives are similar to the freight, but are geared to make a maximum of 45 miles an hour on straight track. The cab, containing an engineer's compartment at each end, and a central compartment for the control apparatus, is carried by two truck frames on center pins. It is of the box type, extends the whole length of the locomotive and is provided with side doors. All parts and circuits carrying 2,400 volts are thoroughly protected from accidental contact.

CANAL LOCK OPERATED BY WATER BALLAST

A self-acting canal lock, so simple that any boatman can operate it, is provided for in a recent patent. By the use of a counterbalance with a water tank, the operation of the gate is reduced to manipulating a valve in a water pipe. The entrance to the lock is built into a masonry bridge across the canal, with a gate, sliding vertically, to close the arched gateway. On the downstream side of the bridge there is a series of inclined tracks for a moving counterweight carrying a tank large enough to change the equilibrium between the gate and the weight. The counterbalance is at the top when the gate is closed, and to open the lock, water is run into the tank until it becomes heavier than the gate and slides down the incline, drawing the gate open at the same time. To close the lock, the water is run out

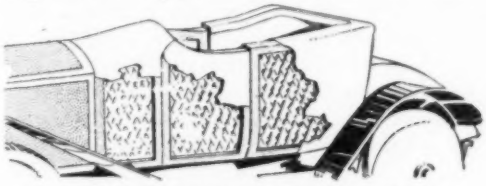


Self-Acting Canal Lock Which is Opened and Closed by a Counterweight Provided with a Water Tank

of the tank, and the gate being heavier than the empty tank, slides down across the gateway and carries the counterweight back to the top.

A MOTOR-CAR BODY MADE OF PAPIER-MACHE

Making motor-car bodies out of papier-maché containing a framework of wire netting in order to obtain a lighter and lower-priced machine, has been suggested. It is claimed that a light steel-wire netting could be woven to the shape of the body and imbedded in a covering of papier-maché or cane pulp by specially constructed compressing machinery, thus giving a minimum

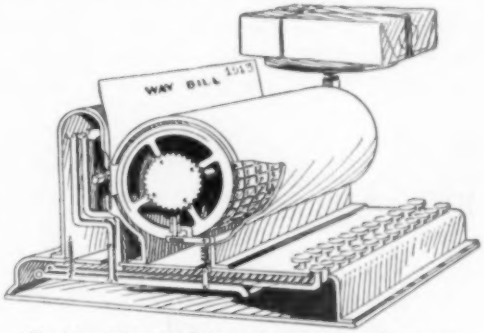


A Papief-Maché Automobile Body Containing a Framework of Wire Netting

weight with great strength, and enabling the bodies to be manufactured in large numbers at low cost.

RECORDING SCALE FOR WAYBILLING

An ingenious waybilling machine recently invented automatically weighs a package and computes the charge for shipment at any given rate per 100 lb., and then prints on the waybill both the weight and the charge. This machine has the appearance of a cylindrical computing scale and works on much the same principle. In using, the package is placed on the platform of the scale and the mechanism is allowed to come to rest, when it indicates the correct weight. A double row of keys occupies the front of the scale, and the one of these corresponding to the rate per 100 lb. for the given distance is then depressed. This results in a further revolution of the mechanism, and at the same time a full record of the weight and charge is printed on the waybill. The waybill is inserted at the back of the cylinder and the printing is done by means of

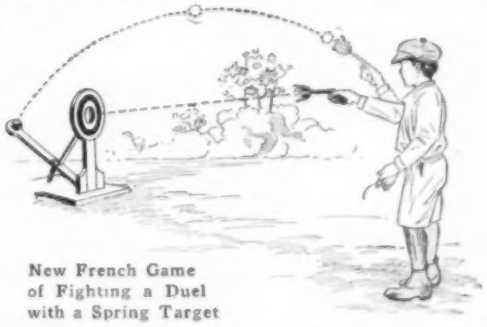


Machine That Weighs a Package and Computes the Charge for Shipment, and Then Prints Both on the Waybill

keys that strike a typewriter ribbon and produce an ink impression on the paper.

FIGHTING A DUEL WITH A SPRING TARGET

The dueling target is one of the new games for children recently introduced in France. It is really a duel between a marksman and a spring target, for every time the player hits the target it throws a rubber ball at him. The weapon used by the marksman is a small spring pistol which fires soft-headed darts and has a wire basket fitted upon the muzzle for catching the returning ball. Behind the target there is a spring arm which is released when a dart strikes the bull's-eye and

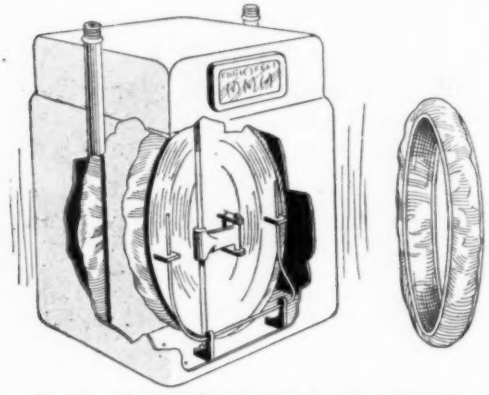


New French Game of Fighting a Duel with a Spring Target

throws a ball in a long sweeping curve toward the player. The game is to fire at the target, hit the bull's-eye, and catch the ball in the wire basket on the end of the pistol.

AN ORDINARY GAS METER HAS SHEEPSKIN LUNGS

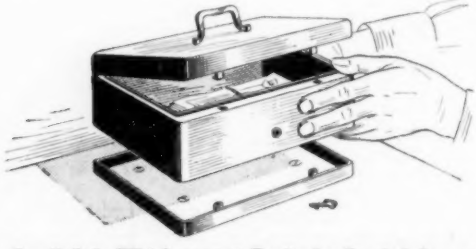
Many consumers of gas do not know that sheepskin enters, to a considerable degree, into the construction of the ordinary gas meter. Two diaphragms, made of pelts fastened to circular metal frames, operate precisely as human lungs when the gas is being used, although the filling of the "bellows" takes place alternately, thus giving a constant and even supply. The skin must be of even thickness and is thoroughly saturated with oil. The repair alone of meters in the United States requires about 300,000 sheepskins a year.



Interior of a Gas Meter, Showing Arrangement of Diaphragms

A NONREMOVABLE SAFE

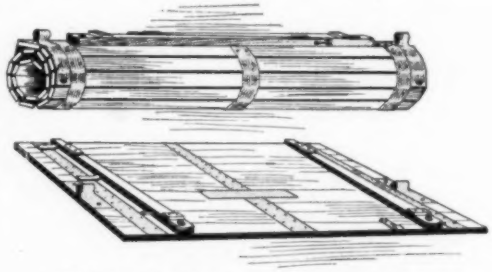
A small safe which cannot well be carried away is a late invention which appeals to the average householder as worthy of note. It has a double bottom which is first screwed to the table or desk, bench or closet, or wherever the owner desires to keep it. Then the box proper is placed upon it, and fitted over certain notches, which, when snapped by the lock above, keep the strong box secure in its place. A 5/8-in. insulation inside makes it fireproof.



Small Safe Which cannot Easily be Carried Away

THIS DRAWING BOARD ROLLS UP

For the surveyor and draftsman who does not like to carry a cumbersome drawing board about with him, a London company is making sectional drawing boards that can be rolled up into a convenient bundle. Each board is made up of a number of narrow wooden strips fastened together with strips of cloth on the bottom. Two pivoted arms keep the board rigid when it is unrolled. If an unfinished drawing is on the board the draftsman can roll up his paper without removing it from the board. The rolling boards are made in many sizes from small sketching boards to 41 by 28-in. draftsman's boards.



Wooden Drawing Board That Rolls into a Convenient Bundle

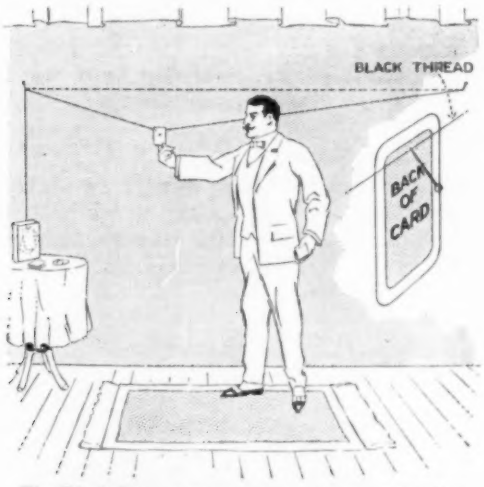
PORTABLE ELECTRIC LAMPS FOR MINERS

The use of portable electric lamps in mines is just beginning in America and the United States Bureau of Mines is conducting experiments to determine the best lamp for the purpose. The chief advantage of the electric lamp for mine use is its safety. The only other portable lamp that rivals it in safety is the locked safety lamp

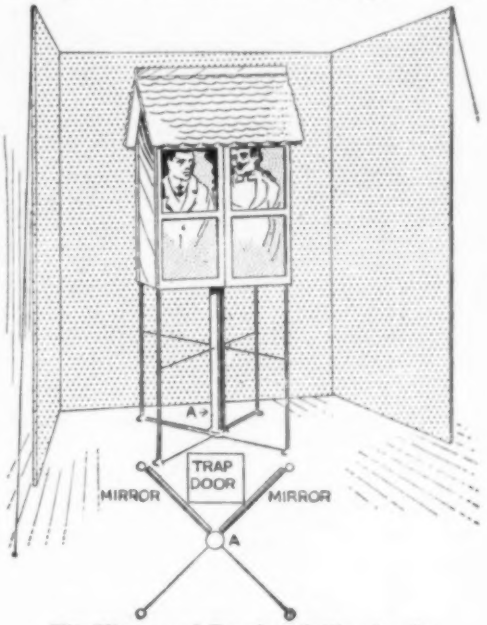
which may often be unsafe, because of improper adjustment, without the user's knowledge. Although the electric lamp cannot be used to detect the presence of gas, it can never be in an unsafe condition without the user knowing it. The only source of danger in the electric lamp is the possibility that the glowing filament might ignite gas after the bulb had been broken. There is no danger from short circuit, because the average battery current of six volts used cannot produce a spark sufficient to explode mine gas. Experiments are now being made to devise a reflector and strong outer glass, so arranged that any blow which will break the bulb will also break the filament or interrupt the circuit. The questions of weight, bulk and capacity of batteries are also being considered.

FAMILIAR CONJURER'S TRICKS EXPLAINED

The question of how it is done is always uppermost in the minds of people who have spent an afternoon or evening watching a conjurer do tricks. Three often seen tricks, "the floating card," "window of apparitions," and "levitation," are here explained. In the "window of apparitions" trick, the house is examined by a committee from the audience and is, of course, found all right. Then, while the conjurer has the attention of the audience directed to the border lights, two mirrors are slid up from underneath the stage. The "three ghosts" then slip up through the stage trap into the house, under cover of the mirrors. After they are in the house the mirrors are lowered. The house is surrounded by a wall of transparent netting, apparently for the purpose of keeping "ghosts" out, but its real purpose is to afford means whereby the audience is made to believe it sees the back wall of the netting when in reality it is the side walls which are seen, through the reflection in the mirrors when they are up in position.



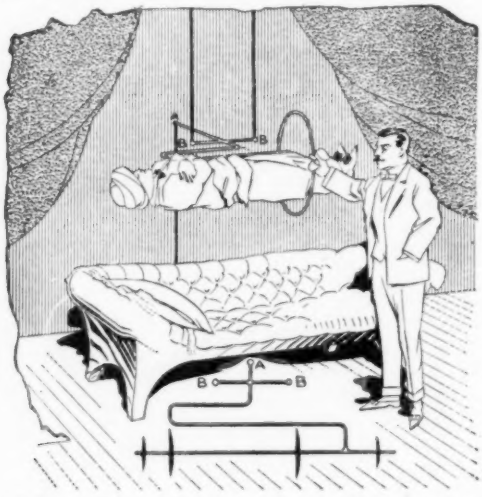
The Black-Thread Arrangement for the "Floating-Card" Trick



The Mirrors and Trapdoor Setting for the "Ghost" Trick

The floating-card trick is simple in the extreme. A piece of black thread is stretched across the room or stage about 2 in. above the conjurer's head. One end is tied and the other is passed over a black-headed pin and allowed to drop 4 or 5 ft. Two playing cards are pinned to the loose end to act as a counterweight. When anyone in the audience chooses a card the conjurer

presses a black-headed pin into its back, then raises the card and hooks it on the unseen thread. The background must



The Manner of Accomplishing the "Levitation" Trick

be dark for this trick. The card is removed from the thread by turning it upside down.

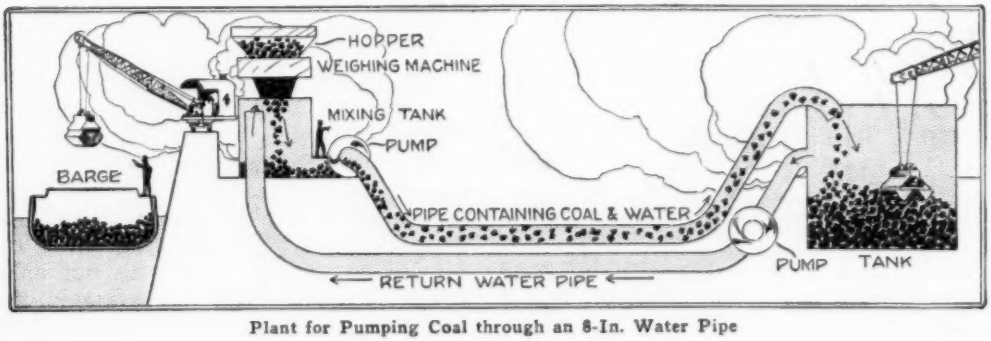
In the "levitation" trick the "S" bar is used to make possible the effective passing of the hoop around the suspended body. Very fine piano wire is used to raise the body. These wires are obscured by the use of an oriental back drop having a large number of perpendicular lines painted upon it.

COAL PUMPED THROUGH WATER PIPE

From 30 to 60 tons of coal an hour will be pumped through an 8-in. water pipe leading from a barge landing on the Thames River, London, to an electric plant 600 yd. distant, according to plans that have been completed and approved. At the river end of the pipe will be located a plant consisting of a hopper, weighing machine and mixing tank. Coal will be lifted from the barges by means of a power-operated grab bucket and deposited in the hopper. The coal will then pass through the weighing machine and mixing tank into the water pipe, the mixture consisting of about 15 per cent of coal and 85 per cent of water. An electrically driven pump will force this mixture of coal and water at high velocity through the pipe to a receiving tank at the works, where the coal will settle to the bottom and leave the water in the upper part of the tank comparatively clear. Through a second pipe the water will be returned from the receiving tank to the mixing tank, there being a constant circulation of water back and forth between the unloading plant and the receiving tank. Coal will be taken from the tank by a grab bucket similar to the one used in unloading the barges.

ENORMOUS DEVELOPMENT OF MODERN INDUSTRY

The tremendous development of modern industry was indicated by a prominent banker recently in estimating the probable needs, in the way of capital, of various classes of industry during the next five years. According to this estimate the railroads of the United States will need during that period $4,000,000,000, and the states and municipalities $1,500,000,000, while



Plant for Pumping Coal through an 8-In. Water Pipe

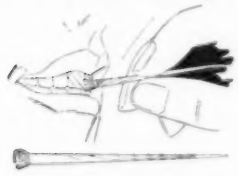
there will be a profitable field in the electrical industry for an investment of $2,000,000,000, making a total in these three fields alone of $7,500,000,000—or an average of over $28,000,000 of fresh capital per week. When to this sum is added the needs of industry in general between the present time and the end of the year 1918, the figures read more like a fairy tale than a practical estimate of business development.

HUNTING VEST HOLDS SHELLS HANDILY

When one shell is pulled out of the receptacle in a new hunting vest, another automatically takes its place. The vest is "loaded" from the top, over which a canvas flap buttons securely, and the long, tubular receptacles sewn into the vest are made for any gauge shells. The vest will carry 32 shells.

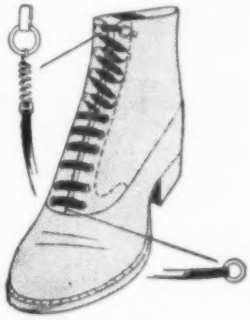
COMBINED TOOTHPICK AND TOOTHBRUSH

A combined toothpick and toothbrush is a novelty recently perfected. It is made of a special wood which can be shredded to form a soft and fleecy brush at one end, doing away with the necessity of inserting any of the usual brush materials. The idea is that after using the pointed end to pick the teeth, the device can be turned and used immediately as a brush. It is stated that the market price of this article will be so low that it can be thrown away after being used once.



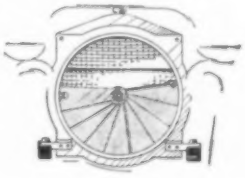
SHOESTRING THAT DOES NOT REQUIRE TYING

A shoestring that can be laced with one hand and does not need to be tied has been brought out by an ingenious French inventor. At the lower end this string has a small eyelet which permits the making of a loop through the first eyelet of the shoe. After lacing the shoe to the top and pulling it tight, the upper end is adjusted to the right length by means of a diminutive buckle to which is attached a spring having a ring on the end. The string is fastened by slipping the ring over the topmost hook.



FOLDING WINDSHIELD FOR RADIATORS

Control of the flow of air through automobile radiators to regulate the wind pressure and the temperature can be accomplished by the use of a folding - shutter windshield which has just been patented. The windshield fits on the front of any radiator and has a circular opening which can be closed by narrow shutters pivoted at the center of the radiator. A thumbscrew on the central pivot holds the shutters in place, and a hoop around the outside keeps them from rattling. When they are folded at the bottom they cover a strip about 2 in. wide.



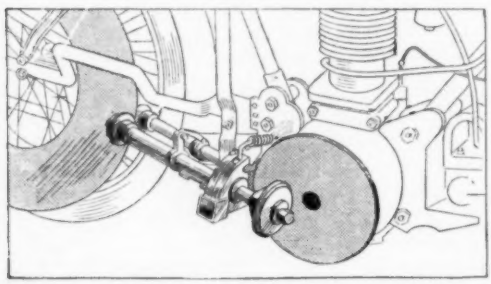
¶The Krupp steel works in Germany employ 76,983 workmen and use 158,485 hp., developed by 431 boilers, 529 steam engines, and 3,392 electric motors.

SCALE WEIGHS EACH FISH AS IT IS CAUGHT

A handy device recently invented for the use of fishermen consists of a small spring scale placed in the handle of a fishing rod, with which each fish may be weighed as it is caught. The scale attachment is mounted inside the handle and does not interfere with the ordinary use of the rod. The device is designed for keeping a systematic account of the weight of the catch.

A NOVEL FRICTION DRIVE FOR MOTORCYCLES

An English motorcycle concern is showing something new in transmission. The device consists of six disks of varying circumferences which are placed as follows: One disk on the main engine shaft; one on the back wheel, and four smaller ones in contact with these. It will be seen that the revolution of the engine disk sets the smaller ones in motion, and so transmits the power to the back wheel. These small disks are free to move backward and forward along a slide rest, being operated by a hand lever at the side of the tank, by this means giving a variety of gear ratios, from 2 to 1 to 10 to 1. The new model is claimed by the makers to be "foolproof" and to stand any amount of hard usage.



Friction-Drive Motorcycle Which Stands Up under Hard Work

SPECIAL HALLMARKS FOR PLATINUM

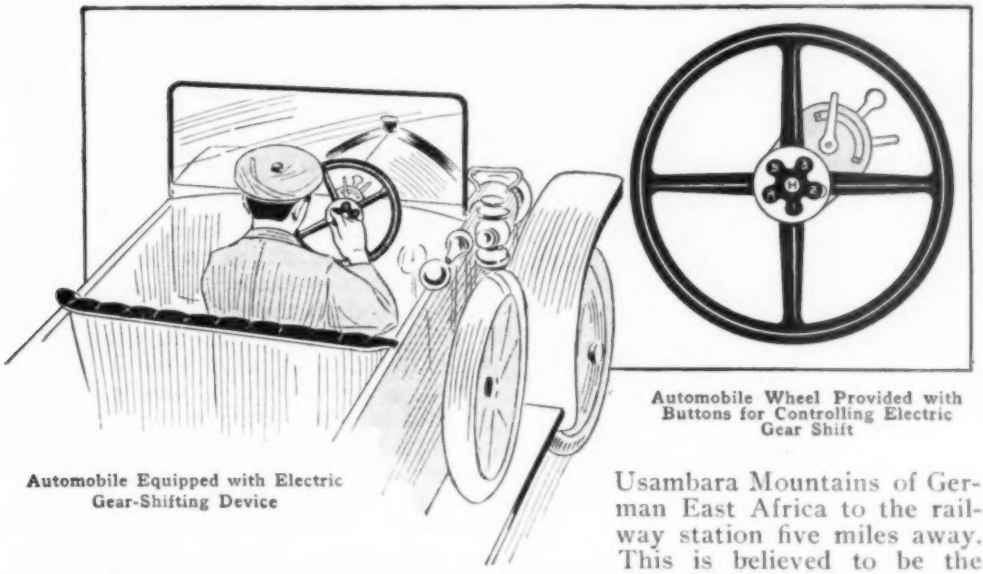
Because of the increasing price of platinum, new alloys of gold, called "white gold" and "palladium gold," have lately come into use as a substitute for platinum in the manufacture of jewelry. To avoid the confusion of these alloys with pure-platinum work, three new stamps, or hallmarks, have been created by a recent decree in France for use in marking jewelry that is composed entirely or in part of platinum. One of the new hallmarks, a dog's head, is used to stamp work of home manufacture which is to be sold in the country; another, the head of a young girl, denotes work of home manufacture intended for exportation; and a mask designates imported goods. In combinations of platinum and white gold, the proper stamps must be used to indicate the various metals. Weights are designated, as in the case of gold hallmarks, by the position of the stamp; for instance, the dog's head with the snout turned to the edge indicates units, and turned in the opposite direction indicates tens.

New Stamps Used in France to Mark Jewelry That Contains Platinum: Girl's Head for Exports; Dog's Head for Domestic Goods; M. k for Imported Platinum Work

¶About 96,000 tons of rubber were produced last year and the price of fine Para has gone down about 5.5 per cent.

ELECTRIC GEAR SHIFTERS FOR AUTOMOBILES

Leverless gear shifting, with all of the gear mechanism operated electrically, will be one of the features of the



Automobile Equipped with Electric Gear-Shifting Device

Automobile Wheel Provided with Buttons for Controlling Electric Gear Shift

1914 automobiles of some makers. With this system a button for each gear is placed on the steering wheel, and in order to engage any gear it is only necessary to push the proper button and depress the clutch pedal. Sliding gears of the usual selective-transmission type are operated by means of solenoids or electric magnets. When the clutch is out, a switch attached to the pedal makes contact, and sends the current from the battery to the solenoid indicated by the button, this solenoid pulling the gear into engagement. As the switch between the battery and the solenoids can only be closed by depressing the clutch pedal, the danger of stripping the gears is eliminated. Buttons are provided for three speeds forward, and for reverse and neutral.

¶Recent tests of paper made from flax straw indicated remarkable toughness and strength of fiber, a medium-weight wrapping paper testing 23 lb. to the square inch and tissue paper 6 lb. to the square inch.

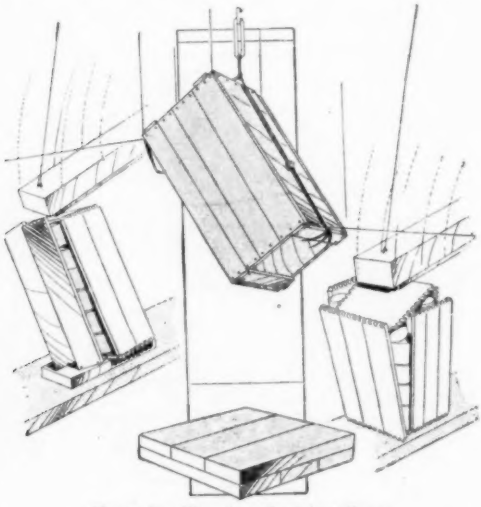
TIMBER TRANSPORTED OVER AERIAL ROPEWAY

An aerial ropeway having a fall of practically a mile is used in transporting timber from a lumber mill in the Usambara Mountains of German East Africa to the railway station five miles away. This is believed to be the steepest installation of the kind used for such heavy duty. Over the ropeway rough or sawed logs up to 46 ft. in length and weighing one ton are carried down the mountain side to the railway, and rails and other equipment and supplies are hauled up to the sawmills. The erection of the ropeway was an engineering feat of considerable difficulty, especially since none but unskilled native labor was available for the work. The installation is of the most modern type and is of steel throughout, the latter feature being necessary on account of the wood-destroying ants that infest the country.

GOVERNMENT TESTS PACKING BOXES FOR RIGIDITY

Tests for durability of wooden packing boxes were made by the Forest Service of the United States Department of Agriculture at the Forest Products Laboratory maintained at the University of Wisconsin not long ago, when 96 cases of three different

sizes were tried in three distinct tests, including endwise compression, diagonal compression, and dropping. Twenty-four of the boxes were nailed,



Tests for Wooden Packing Cases

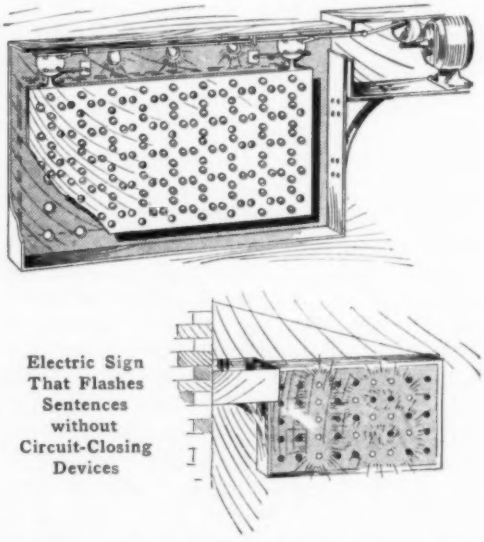
32 were wire bound and 40 dovetailed. Each box was filled to its capacity with cans of water. In the drop test, a box was allowed to strike on one corner on a heavy board platform resting on a cement floor, and 6 in. were added to the height of each preceding drop until the contents fell out. In this instance, wire-bound boxes showed great resistance and, altogether, this class revealed well-balanced construction. The tongue-and-groove joints of dovetailed cases were weak features of construction, although this style stood up well in the diagonal compression test, under which nails pulled out in the nailed boxes.

INJURED AIRMAN FLIES AGAIN

Although disabled in an accident, so serious that he lost his leg in the hospital, one French airman did not lose his nerve, but as soon as he regained his strength took the part of passenger in one trip, and some weeks thereafter made a flight alone, handling his machine with all his old-time skill and courage, using his artificial limb to push the rudder bar in quite the normal way. While in the hospital this nervy Frenchman had tetanus, but owing to his wonderful constitution he pulled through, studied the cause and effect of tetanus, and warns all airmen that if they ever have a smash-up in which earth is mixed up in their wounds they should without fail secure an injection of antitetanus serum.

NEW ELECTRIC SIGN USES PERFORATED PLATES

An electric "talking sign" that does away with the usual circuit-closing and breaking mechanism has been invented by a Kansas woman. This sign may be made to flash the words of entire sentences or the outlines of complicated designs as desired. This is accomplished by the use of two perforated plates in which certain perforations in the two plates are made to coincide for producing the words or designs required, and lights properly placed in the rear of the device for illuminating the clear openings produced in this manner. The front plate is stationary,



Electric Sign That Flashes Sentences without Circuit-Closing Devices

while the rear plate rotates about the center of the device so that each perforation in this plate describes a circle. Stops are provided for closing perforations not in use, while lenses are

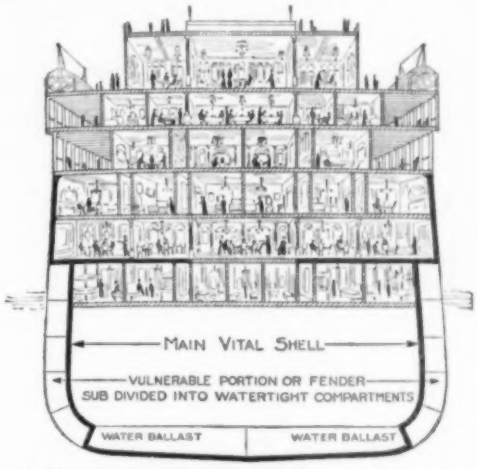
placed over the perforations of the outer plate for magnifying the effect. When flashing a sentence the mechanism works intermittently so that each word remains visible for the specified length of time, but in outlining designs the mechanism may be made to work continuously, producing figures that are apparently in motion.

DRILL HOLES INCREASE STRENGTH OF STEEL

When holes are drilled in soft steel and then reamed the metal is materially increased in strength, according to tests recently made at the Ecole Centrale in Paris. A series of tests indicate that the elastic limit is raised about 12.3 per cent and the tensile strength 9.2 per cent. This phenomenon is explained by comparison with the breaking of a piece of steel under tension, where the rupture always begins at the center of the bar, an action that shows that the edges have a higher tensile strength than the axis or center of the bar. In the same way, if several holes are drilled in a bar in such a way as not to injure the adjacent metal, the average tensile strength of the section across the holes, per unit of metal, will be higher than before the holes were drilled, since each hole, in effect, creates additional edges.

NEW KIND OF DOUBLE SKIN FOR SHIPS

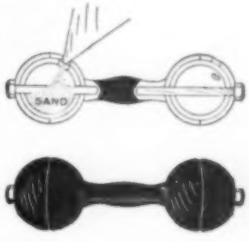
The use of the double-skin construction to protect ocean liners in case of collision, or other accident, is being developed in a new way by an English ship architect. As the double-skin idea was worked out in the remodeling of the "Olympic," it developed from the construction of the double bottom and consisted in placing a second, thinner wall inside the main shell of the vessel. The new plan, as it has been patented, makes the inner skin the main, vital shell of the vessel, to which all the main frames are attached, and places the lighter, more vulnerable skin on the outside as a kind of fender to protect the main shell. If the heavier skin is on the outside, the inventor claims, it will crush through the inner shell in case of collision and render the double construction useless. But no ordinary collision would be able to drive a lighter outer shell through the heavier wall inside.



A New Double-Skin Construction for Liners, in Which the Main, Heavy Shell is Inside

DUMB-BELLS OF ADJUSTABLE WEIGHT

Weight-loading dumb-bells which can easily be filled or emptied have recently been patented and placed on the market. Each ball of the new dumb-bell is made of two pressed-steel spheres, one inside the other, which can be revolved separately when the nut on the end of the main bolt is loosened. There is a hole in each sphere and the two holes can be brought together so that sand or shot can be poured in or out. When the holes are not facing each other, the balls are nonleakable. Such a dumb-bell can in this way be made to vary from 3 to 30 pounds.

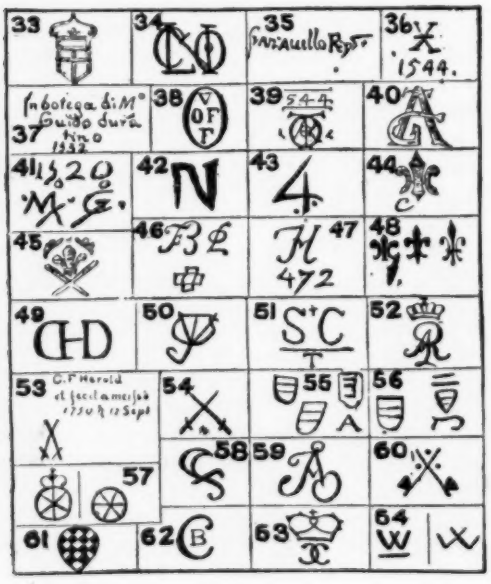


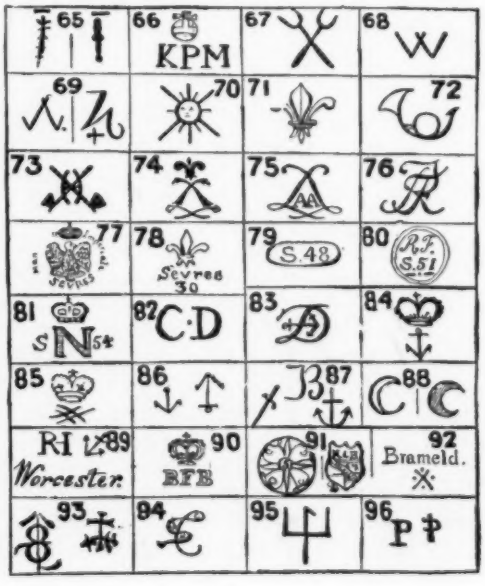
Almost every family has one or more pieces of old china. It may be a plate or a teapot brought from the old country; sometimes a soup tureen or punchbowl handed down in the family from past generations; often an odd or curious bit of pottery "picked up" at an auction or bought in a curio shop.

Almost every piece of china bears the mark of the maker, from which it is possible to determine just when and where it was made. There are thousands and perhaps tens of thousands of such pottery marks known to experts. Some of them are illustrated herewith, with explanations referring to numbers. The oldest known marks are, of course, the Chinese.

Chinese: 1—From the time of the Tang dynasty, about 618 A. D.; 2—Hou-Tsin dynasty, about 936 A. D.; 3—Ming dynasty, 1465-1487; 4—Tsoung-Te dynasty, 1636. Japanese: 5—Satsuma; 6—Kaga; 7—Guik-Mon Chrysanthemum (Imperial mark); 8—Kioto. Spanish: 9—Hispano-Moresque, 15th century; 10—Manises, 17th century; 11—Hispano-Moresque, 16th century; 12—Seville, modern; 13—Buen-Retiro, factory founded in 1769; 14—Pesaro, 1582; 15—Pesaro. Italian: 16—Florence, 1454, supposed to be the mark of Luca della Robbia; 17—Florence, 1429; 18—Faenza, Don Giorgio, 1485; 19, 20—Faenza, 16th century; 21—Castel Durante, Giovanni Maria Vasaro, 1508; 22—Castel Durante, 16th century; 23—Deruta, 16th century; 24—Deruta, 1579; 25—Rimini, 16th century; 26—Venice, 1510; 27—Venice, about 1760; 28—Padua, 16th century; 29—Savona, 18th century; 30—Siena, 1542; 31—Genoa, 18th century; 32—Milano, 18th century.

33—Turin, 17th century; 34—Nicolo da Urbino, 16th century; 35, 36—Urbino, 16th century, Francesco Zanto Avelli da Rovigo; 37—Urbino, Guido Durantino, 1532; 38, 39—Urbino, 16th century, supposed to be made by Orazio Fontana; 40, 41—Gubbio, Maestro Georgio Andreoli, 1519-1537. French: 42, 43—Nevers, N. Viode, 17th century; 44—Rouen, 17th century; 45—Rouen, 18th century; 46—Moustiers, Olery; 47—Strassburg (P. A. Hannong), 18th century; 48—Marseilles, 18th century; 49, 50—Orion, St. Prochaire; 51—St. Cloud (Faience), Trou, 1722. German, Austrian, etc.: 52—Dresden (Augustus Rex), Royal Saxon, 1709-1726; 53—Dresden (Meissen), 1750; 54—Dresden (Meissen), one or more stars designate the so-called Marcolini period; 55, 56—Vienna, 1718-1864; 57—Höchst, founded in 1720; 58—Fürstenburg, founded in 1750; 59—Frankenthal (P. A. Hannong); 60—Arnstadt, 18th century; 61—Nümphenburg, founded in 1758 (the coat of arms of Bavaria); 62—Baireuth, 18th century; 63—Ludwigsburg or Kronenberg, founded in 1758; 64—Berlin, Wegeley, founded in 1751.





65, 66—Berlin, 1761, 1830; 67—Rudolstadt, founded in 1750, being the coat of arms of the principality of Schwarzburg; 68—Wallendorf, founded in 1763; 69—Limbach, founded in 1766. French: 70, 71—St. Cloud, Chicanneau, after 1702; 72—Chantilly (Ciquaire Cinon), after 1735; 73—Vincennes (P. A. Hannong), 1767; 74—Vincennes (letters A, B, C, etc., designate the years 1753, 1754, 1755, etc., until 1777); 75—Sèvres, 1778-1793; 76—Sèvres, mark of the first republic; 77—Sèvres, 1809-1814; 78—Sèvres, 1830; 79—Sèvres (mark is in green on white porcelain), 1848-1850; 80—Sèvres, 1851; 81—Sèvres, 1852-1871; 82—Limoges (M. Massec), about 1774. English: 83, 84—Chelsea-Derby, 1769-1780; 85—Crown-Derby, 1780; 86—Chelsea, 1745-1769; 87—Bow, 1730-1775; 88—Worcester, founded in 1751; 89—Worcester, about 1758 (Richard Holdship); 90—Worcester, 1783; 91—Worcester, Kerr & Binns, 1852-1862; 92—Swinton, known as Rockingham, founded in 1751; 93—Caughley, Turner, 1772-1799; 94—Coalport, J. Rose, founded in 1790; 95—Swansea, founded in 1750; 96—Liverpool, founded by Chaffers in 1760.

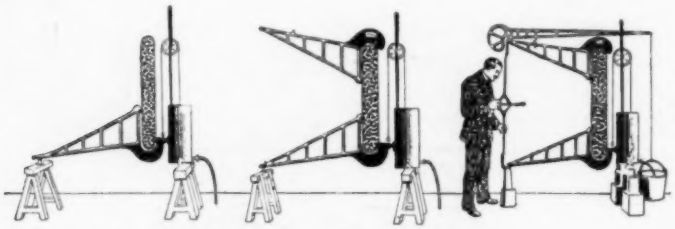
97—Liverpool, founded by Richard Abbey in 1790; 98—Burslem, Wedgwood & Bentley, 1759; 99—Etruria, Wedgwood; 100—Stoke-upon-Trent, Copeland; 101—Stoke-upon-Trent, Minton; 102—Stoke-upon-Trent, Minton, 1851; 103—Stoke-upon-Trent, Minton, Hollins & Co., 1868; 104—Shelton, Cauldon Place, founded in 1860; Brown, Westhead, Moore & Co. Miscellaneous: 105—Paris, Théodore Deck; 106—Choisy le Roi, founded in 1786; 107—Gien, founded in 1864; 108—Sarreguemines, Utzschneider & Co., founded in 1770; 109, 110—Utzschneider & Co., modern marks; 111—Bordeaux, Lahens & Rateau, 1829; 112—Bordeaux, Viellard; 113—Neiderviller, Lanfray, 1802-1827; 114—Creil, founded about 1790; 115—Schlangenwald, founded in 1800; 116—Birkenhammer, Christian Fischer; 117—Birkenhammer, Fischer & Reichenbach; 118—Altenrohlau, Nowotny; 119—Elbogen, founded by Haidinger in 1815; 120, 121—Herend, Moritz Fischer; 122—Capo di Monte (Naples), 1736-1821; 123—Capo di Monte, about 1759; 124—Capo di Monte, about 1780 (letters R F standing for Rex Ferdinandus); 125-127—Florence, La Doccia Ginori, founded in 1737; 128—Luxemburg, Boch, founded in 1767.

129—St. Petersburg, 1762-1796; 130—St. Petersburg, 1801-1825; 131—St. Petersburg, 1855; 132, 133—St. Petersburg, Kornilov, founded in 1827; 134—Moscow, Gordner, founded in 1787; 135—Limoges, J. Pouyat; 136—Limoges, W. Guerin & Co.; 137—Limoges, Haviland & Co.; 138—Vierzon, Hache & Co.; 139—Golfe-Juan, Clément Massier; 140—Maastricht, Société Céramique; 141—Maastricht, P. Regout; 142—Delft, Joost-Thooft & Labouchère; 143—The Hague, Rozenburg; 144—Delft, Joost-Thooft & Labouchère; 145—Rockwood, near Cincinnati; 146—Strassburg, P. S. Hannong, 1752; 147—Stralsund, Ehrenreich, 1768; 148—Hanley, W. H. Grindley & Co.; 149—London, Lambeth, Doulton & Co.; 150—Hanley, Johnstone Bros.; 151—Dresden, Villeroy & Boch; 152—Mettlach, Villeroy & Boch; 153—Bonn-Poppelsdorf, Ludvig Wessel; 154—Bonn, Franz Ant. Mehlen; 155—Altwasser, C. Tielsch & Co.; 156—Sorgau, Hermann Ohme; 157—Fraureuth; 158—Selb, Ph. Rosenthal & Co.; 159—Selb, Lorenz Hutschenreuther; 160—Hohenberg, C. M. Hutschenreuther.

161—Klösterle, Count Thun; 162—Fünfkirchen, W. Zsolnay; 163—Fischern, Carl Knoll; 164—Budapest, J. Fischer; 165—Naestved (Denmark), H. Kahler; 166—Copenhagen, Royal Danish Porcelain factories; 167—Copenhagen, Bing & Gröndahl; 168—Porsgrund (Norway); 169—Egersund Faience factory (Norway); 170—Gustafsberg (Sweden); 171—Gotenberg (Sweden); 172—Rörstrand (Sweden), after 1884; 173-179—Rörstrand, 1736-1744; 1745; 1758; 1762; 1760-1773, and 1766-1773, resp.; 180—Marieberg (Sweden), before 1764; 181—Marieberg, 1768-1769; 182—Marieberg, 1770-1787; 183—Marieberg, probably 1780; 184-187—Marieberg, hard-paste porcelain, 1776-1786.

A MACHINE FOR TESTING CONCRETE BEAMS

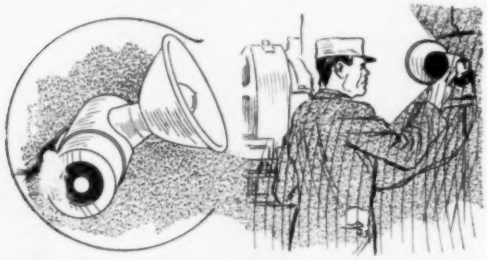
A machine recently invented for testing concrete beams consists of an upper and a lower arm, shaped somewhat like a short ladder, the inner ends of which exert force by means of a counterweight or bucket of water attached to a rope and third arm, as shown in the accompanying illustrations, that represent the different stages in assembling and operating the tester. The entire apparatus weighs about 400 lb. and is capable of exerting a pressure of 19,800 pounds.



Testing Concrete Beams in an Upright Position

MAGNETIC TROUBLE LAMP HOLDS ITSELF

For motorists and launch owners a magnetic trouble lamp has been invented which sticks anywhere on any iron or steel surface, leaving both of the user's hands free for his work. A strong electromagnet, with a sticking face 1⅝ in. across, is built in the handle and wired in parallel with a 4-cp. lamp. As it weighs only 13 oz. and its magnet has a pull of 13 lb., it is not easily jarred or knocked off. Four dry cells will supply the necessary current.



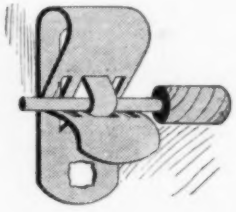
Trouble Lamp for Motorists on a Magnetic Base

PAPER FROM ASPARAGUS FOUND PRACTICAL

A German professor has developed a process for the recovery of cellulose from asparagus waste and from asparagus stalks which are allowed to mature after the edible crop has been gathered. The operation, which has been patented, includes the treatment of the vegetable with sulphurous acid in steam-tight vessels for one to three hours. After the material is washed with oxidizing and reducing substances, it is ready to be manufactured into paper, bandages, tissues, cardboard, etc.

SPRING BINDING POST FOR ELECTRICAL CONNECTION

In this substitute for the screw-and-nut type of electrical binding post all that is necessary is to just press the spring down, push the wire in, and let go. The result is claimed to be a connection that will not pull out or jar loose.

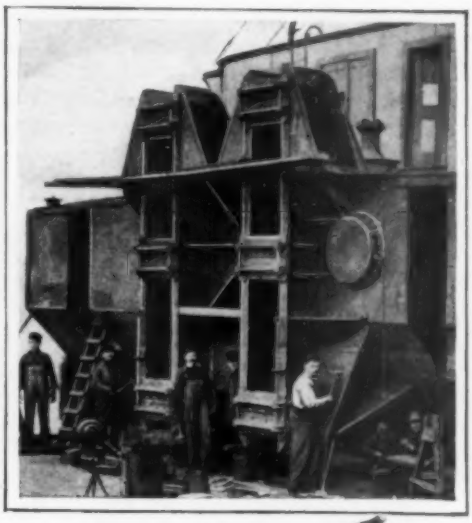


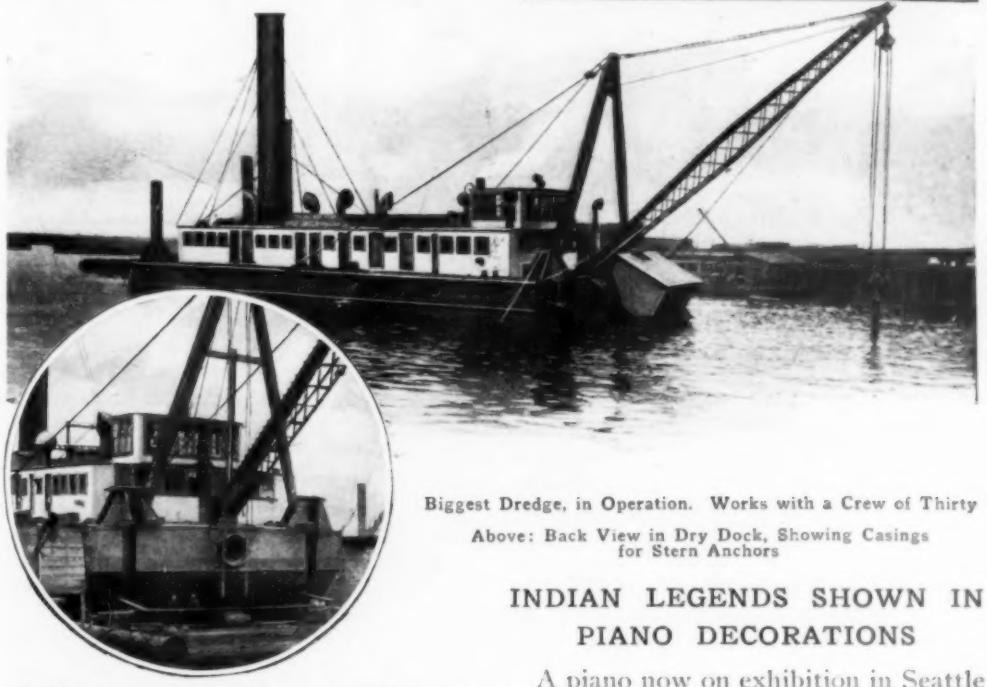
DEEP BORING WITH STEEL SCRAP

A method of deep boring through stone strata by means of steel chips and scrap has been developed in France, and has proven very successful and economical. Steel scraps are forced under the boring head with the flushing water, the head being provided with saw-toothed projections which hold the chips until used up. The amount of steel chips to be used varies, of course, with the nature of the stone to be bored. The cost of the new method compared with diamond drilling, other things being equal, is only one-fiftieth as great.

LARGEST HYDRAULIC DREDGE AT WORK IN HARBOR

Contractors completing Toledo's great harbor plan are making use of a hydraulic suction dredge which is one of the largest in the world. It is built entirely of steel, properly reinforced with extra-heavy trusses, is 150 ft. long, 45 ft. wide and has a draft of 9 ft. The main engine for driving the centrifugal pump develops 1,500 hp., the two boilers operating on 200 lb. of steam. The suction end of the pump, over 2 ft. in diameter, is equipped with an agitator or cutter, and can be swung to make a channel 40 ft. deep and 200 ft. wide, without changing position. Over 300,000 cu. yd. of material may be handled in 12 hours, discharging the earth excavated a distance of one-half mile away by means of large pumps. A crew of 30 is carried, all well cared for, with ample accommodations for eating and sleeping on board.





Biggest Dredge, in Operation. Works with a Crew of Thirty

Above: Back View in Dry Dock, Showing Casings for Stern Anchors

Dredge in Dry Dock, Showing Bow with Large Center Hole through Which Suction Pipe Passes

INDIAN LEGENDS SHOWN IN PIANO DECORATIONS

A piano now on exhibition in Seattle has a case covered with decorations representing some of the oldest legends of the Alaskan Indians. The top front panel illustrates the legend of "The Four-Eared Bear," one that plays an important part in the ceremonials of Indian tribes of the Northwest. According to this legend, there lived on a small island known as "Dead Man's Reach," a four-eared bear, a

monster with human intelligence and supernatural strength, which had the amiable habit of occasionally catching an Indian hunter and holding him captive on the island. Here the hunter was made to serve as a slave, to be promptly eaten as soon as the next victim was captured. A young chief finally succeeded, partly by magic and partly by his skill as a fighter, in breaking up this system by killing the monster. Thereafter, this chief, in order to enforce any demands he cared to make on another chief, had only to send his canoe paddle on which the image of the four-eared bear was carved.

Piano Decorations Illustrate Legends of Alaskan Indians

The end panels of the piano illustrate the "Moon" story of the Hydah tribe, a legend relating to the successful stealing of the moon from the Indians of Kou Island, who had long had possession of this valuable accessory in night hunting. The representation of these legends was designed by an artist who lived for over 30 years among the tribes of totem makers and learned many of their legends.

NORWAY TO ADOPT A NEW TONGUE

In 1914 Norway will celebrate the centennial anniversary of her emancipation from Denmark and the recovery of her independence as a separate kingdom with a constitution of her own, though united by dynastic ties with Sweden until 1905. It is proposed to signalize the national rejoicings in honor of the occasion by the adoption in due process of law, of a new tongue as the official and national language of Norway. About 60 years ago Ivar Aasen, philologist, patriot and scholar, of Norway, constructed a language which he named "Landsmaal," and embodied in his new speech much of the old Norse and ancient Sagas, as well as the idioms and dialects of the remoter regions of the kingdom, where the peasantry have clung through four centuries of Danish domination to the tongue spoken by their forebears in the days of the Vikings. Employing these and other materials and adapting them to modern requirements, Aasen succeeded in evolving so melodious and poetic a language that the vast majority of his countrymen, commencing with the rural population, have accepted it for their songs, for their plays, for their sermons and for their vernacular. True, neither Henrik Ibsen, Björnsen, nor any other Norwegian author of great renown has used "Landsmaal" in his best works, but the common people accept it gladly, and that it will be the vehicle of national drama and of high authorship in the future, few Norwegians doubt. Landsmaal is phonetic, and

is not so radically different from the printed Danish language that an educated Dane can not make it out. Something of the sort has been accomplished in Finland, save that now an educated Finlander must learn three languages, Finnish, Swedish, and Russian, in order to keep abreast of the times in his own land.

NEW METHODS IN CAISSON BUILDING

An unusual method in caisson building has been adopted for the Equitable building in New York. Instead of circular molds, some 6 ft. in diameter, solid masses of reinforced concrete are used, about 18 by 6 by 75 ft. in dimension, the block being built up in sections, and sinking by its own weight as built. The workmen, "sandhogs," as they are called, toil in the compressed air beneath, excavating a path for the sections to bedrock, 75 ft. below. Instead of a metal shaft for the removal of the debris, the buckets go directly into a cylindrical opening in the center of the cement blocks, and are hoisted to the surface in the usual way. The new building will be 36 stories high and will cover a greater area than, perhaps, any other office building in the world.

New-Style Concrete Caissons Used in Construction of Large Office Building in New York

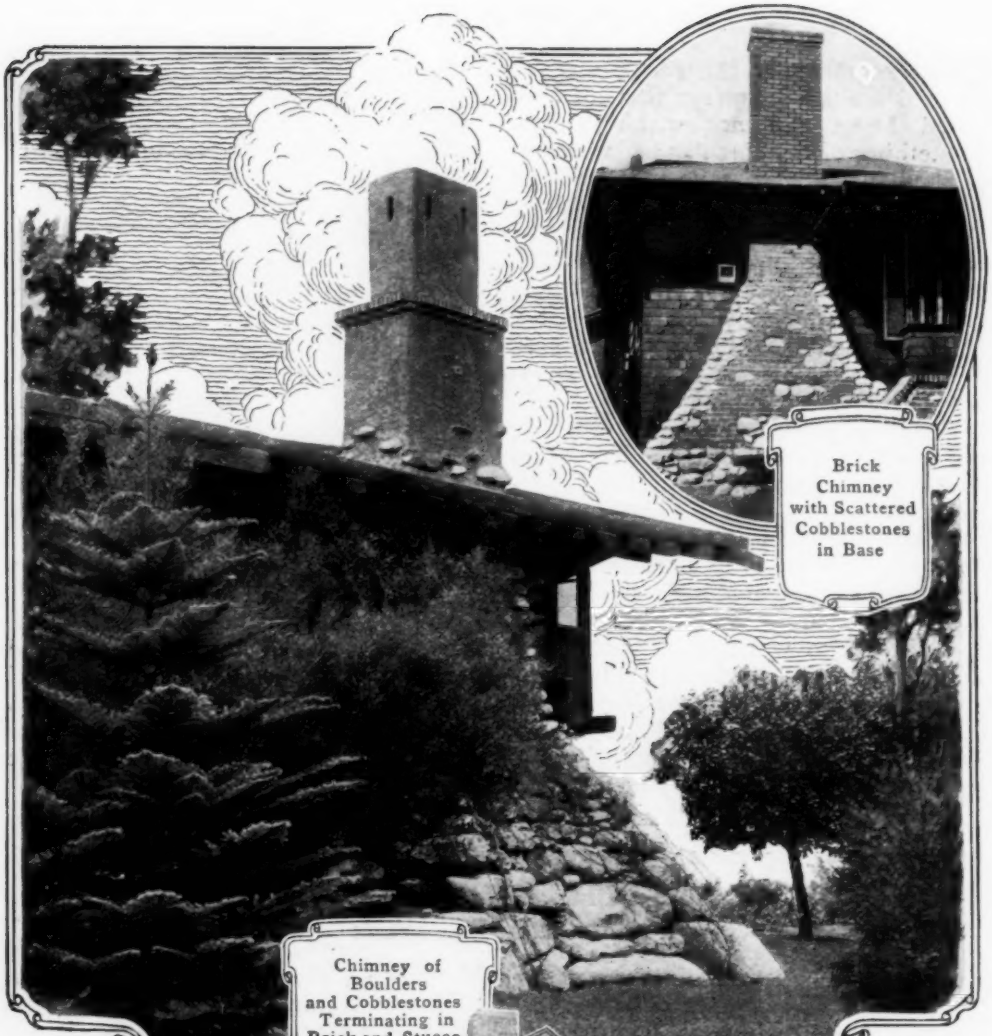
THE PROMINENT CHIMNEY A FEATURE OF THE BUNGALOW

By CHARLES ALMA BYERS

In the construction of the western bungalow the prominent chimney has become a characteristic feature. It invariably receives a great deal of attention, and often very picturesque designs are created. The architecture of the bungalow is such as to seem to especially invite the use of something odd in the way of chimney construction—a chimney that stands out conspicuously and helps to give to the house a rustic and rambling appearance. One of the most admirable assets of the bungalow, according to its builders, is the style's susceptibility to individual taste, and probably no other single feature is capable of lending to it greater individuality than the chimney.

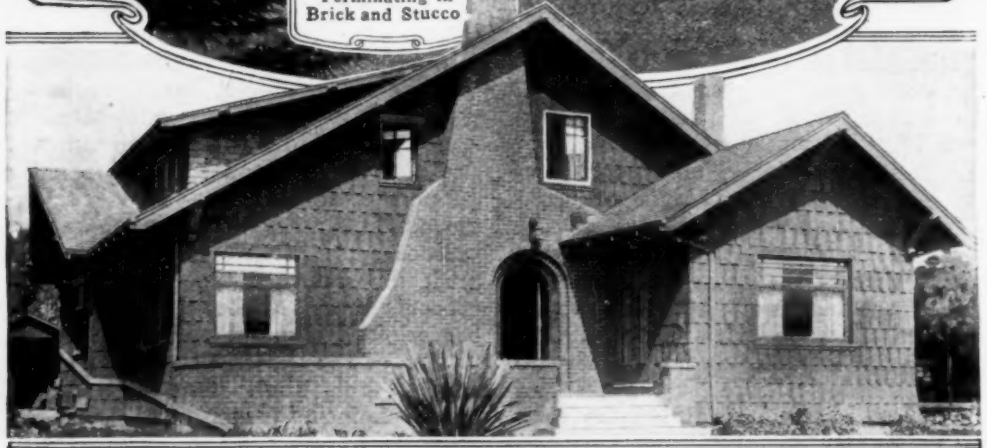
Bungalow chimneys are frequently of unusually massive proportions. Very often they have the appearance of being nothing more than a pile of stones, rather carelessly heaped up against the house, to form a kind of pyramid. Of such creations, the base will be of boulders, some probably weighing as much as one hundred pounds, and from the ground upward the size of the stones will gradually dwindle into medium-sized cobblestones. Chimneys of this character, besides being picturesque, tend to create a link between the house and the grounds that is especially desirable in bungalow designing.

Two of the illustrations show chimneys of this kind. One possesses a heavy coping of cement, and the other, a few feet from the top, terminates in brick and stucco. Another of the illustrations shows a chimney constructed

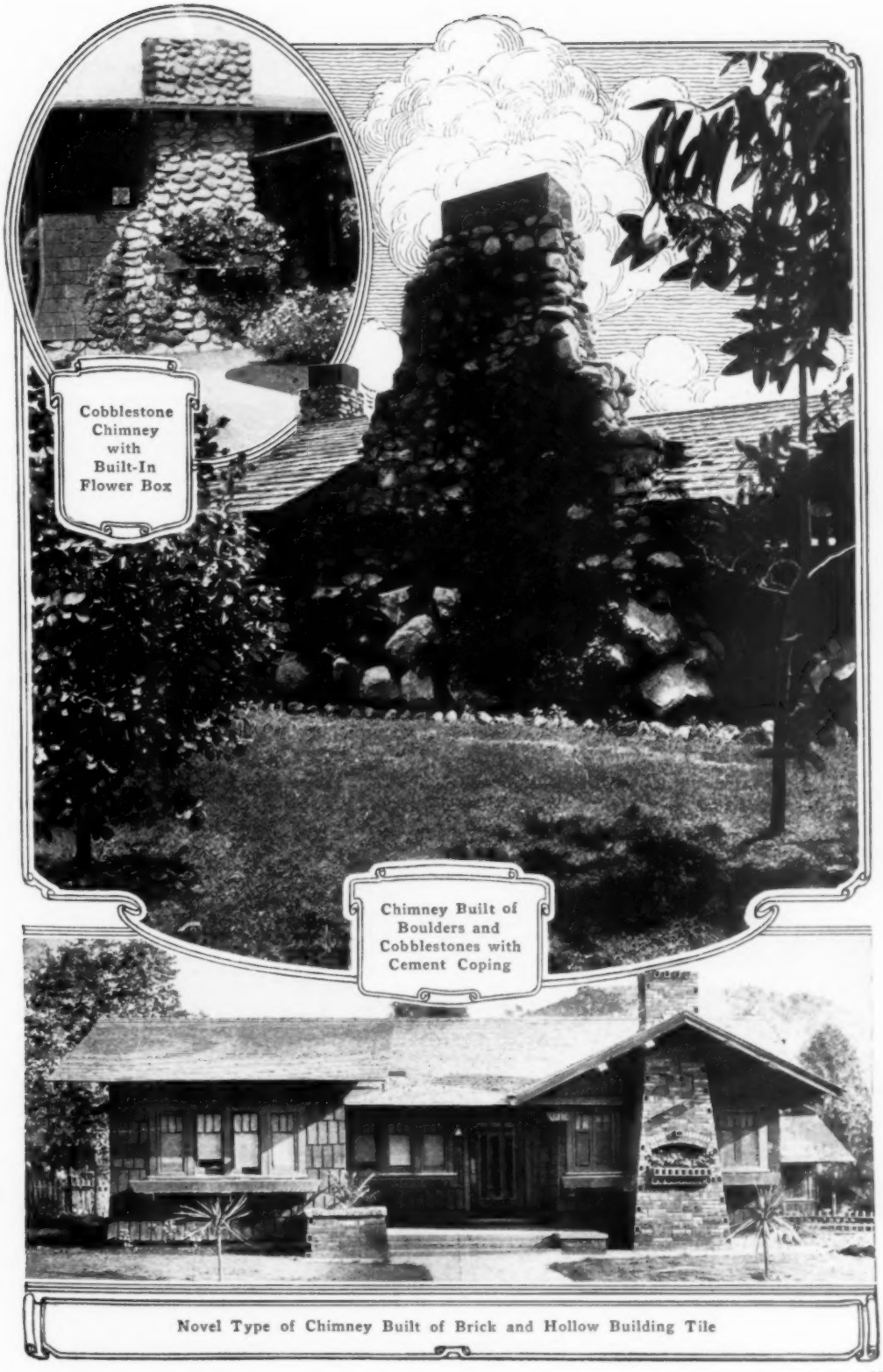


Brick Chimney with Scattered Cobblestones in Base

Chimney of Boulders and Cobblestones Terminating in Brick and Stucco



Brick Chimney with Front Doorway of Bungalow Passing through Base



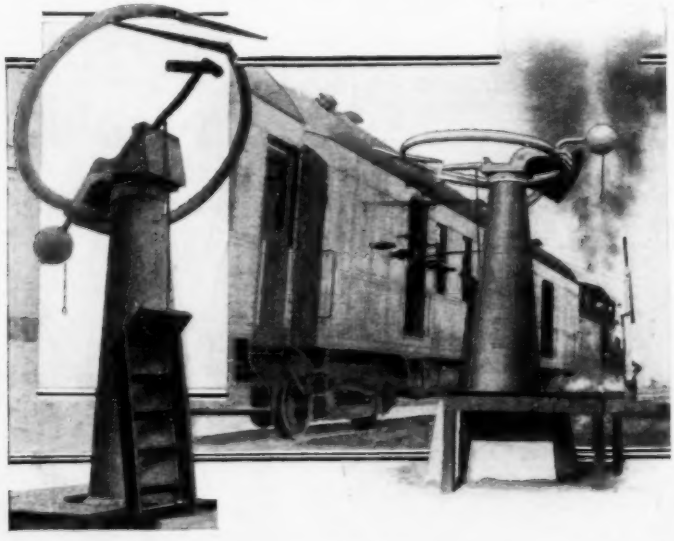
Novel Type of Chimney Built of Brick and Hollow Building Tile

entirely of cobblestones, of comparatively uniform size, in the front wall of which has been created a flower box. Cobblestones, in fact, are very popular with builders of bungalows, and, while they may often have the appearance of being carelessly thrown together, they are really securely held in place with a black mortar that has been raked out to leave as much of the surface of the stones exposed as possible. Another very attractive bungalow chimney is constructed of brick with a few cobblestones scattered, hit and miss, through the broad base. It has a more dignified appearance, and is therefore more adaptable for certain city locations. Chimneys that are inclined toward the "freaky" are also quite often created by these builders. An accompanying illustration shows one constructed entirely of brick with the front doorway passing through its broad base, and another portrays a chimney built of brick and hollow building tile.

Clinker brick, since they create a rough surface, are frequently used, as, in fact, is nearly every other kind of masonry material that will produce either a rustic or massive appearance, or both combined. Such chimneys seem to particularly suit this architectural style because of the low and comparatively flat roof, and no doubt do much toward emphasizing this general effect. Unquestionably the bungalow permits greater freedom and variation in chimney construction, in regard to both design and the kind of material used, than any other style of home.

A MAIL EXCHANGER OF PECULIAR DESIGN

This mail-exchanging device, which was recently indorsed by the United States government and is being used on one of the southwestern divisions of the Southern Pacific Railroad, is of an exceptionally substantial design. It handles both heavy and light sacks with equal facility, whether the train is traveling at 5 or 60 miles an hour. Special exchange sacks are used, filled with regular mail pouches, the load often being as high as 450 pounds.



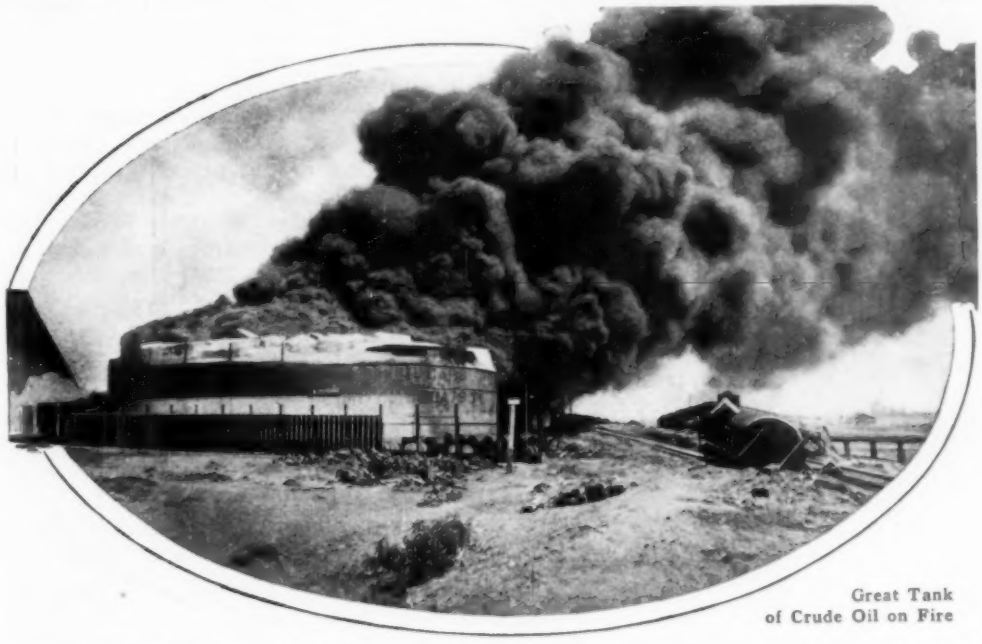
A Substantial Mail Exchanger Used on the Southern Pacific Railway

The device consists of a pair of circular horns, which rest in a cradle supported by a cylindrical steel standard. The standard, which is about 15 ft. high and 3 ft. in diameter at the base, is imbedded in a concrete foundation. The part of the apparatus in the mail car comprises a pair of ceiling rails and a steel arm on wheels, to which the bag intended for delivery is fastened. The bag to be delivered is hung on the delivery arm and pushed out through the door, this movement

automatically setting the catcher hook in position to receive the mail sack from the station. When the train passes, the hook on the station standard and the hook on the traveling arm of the mail car run through the rings of the respective bags and the exchange of sacks is made at the same instant. The sack caught by the train hook is carried into the car by the traveling arm and deposited on the floor, while that left on the station standard awaits the arrival of the agent to be removed. The horns on the standard tip upward and backward on delivering and receiving the sacks, thus absorbing much of the shock and at the same time making the track clearance required by the government.

MILLION AND HALF GALLONS OF OIL BURNING

One of the most disastrous oil fires on the Pacific Coast occurred recently, when a fire started in the yards of the Standard Oil Company at San Diego, by the explosion of an oil tank containing 20,000 gal. of distillate. The fire quickly spread. A gasoline tank holding 260,000 gal. exploded and communicated the flames to the monster crude-oil tank shown in the illustration, which contained 1,250,000 gal.



Great Tank of Crude Oil on Fire

In all 10 tanks were destroyed. The burning oil overflowed and ran, flaming, into the bay, where the fire burned itself out without other damage than the loss of the oil. More than 1,500,000 gal. of oil and gasoline were lost.

ELECTRIC LIGHT CONTROLS SMOKING ON SHIP

Things on shipboard in the modern navy do not happen, they occur at stated times and in definite places.

While These Electric Lamps are Lighted Man-o'-War's Men May Smoke

Sailors may smoke only when the "smoking lamp" is lighted. At other

times smoking is forbidden. The electric light and sign shown in the picture are a feature of the smoking room on board one of the United States war vessels. The light burns at intervals throughout the day. Then, and then only, may the enlisted man soothe his nerves with nicotine.

SEAT FOR TRAFFIC OFFICER

Believing that efficiency is secured where there is the least possible distraction, a traffic officer of Phoenix,

Seat for Traffic Officer

Ariz., has devised a shaded seat, portable and dismountable, which gives him the opportunity for undisturbed view of traffic without bearing the heat of Arizona sunshine. The sunshade seat is made of gas piping, a buggy top and an office chair. The seat has a back and revolves in any direction; the top is adjustable at any angle to meet the sun, and all or part is removable at a moment's notice.

MOST POWERFUL GAS ENGINE EVER BUILT

What is believed to be the most powerful internal-combustion engine in the world has been installed in an automobile manufacturing plant at Detroit, Mich. This engine uses producer gas and has four double-acting cylinders, each 42 by 72 in., placed two in tandem on each side of the frame. The piston travel is 1,020 ft. per minute and the engine is rated at 6,000 hp. when running at 85 revolutions per minute. The length of the engine from the front of the pillow block to the end of the tail-rod extension is 73 ft., while the extreme width is 32 ft. A 160,000-lb. flywheel is connected to the engine by a crankshaft that is 25 ft. long and 32 in. in diameter at the middle. This engine is used to drive a 2,500-kw. direct-current generator.

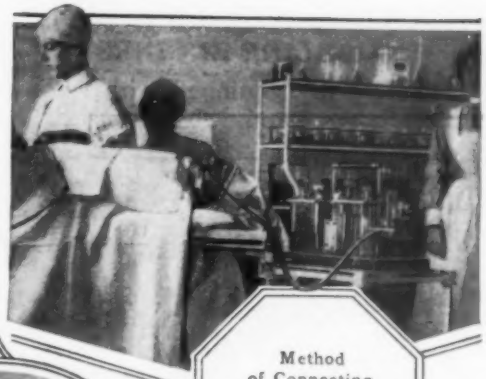
SEALED CARTONS PROTECT CEREALS

Experiments made by the Bureau of Entomology of the U. S. Department of Agriculture indicate that sterilization of cereal products before shipment is not enough to protect the consumer from loss or dissatisfaction. Slight breakages of the package afford ingress to moths or beetles. But if the cereal is packed in paper cartons, sealed with flour paste or glue, or covered by a paper label, similarly sealing the joints of the package, there is much less liability of the cereal being infested.

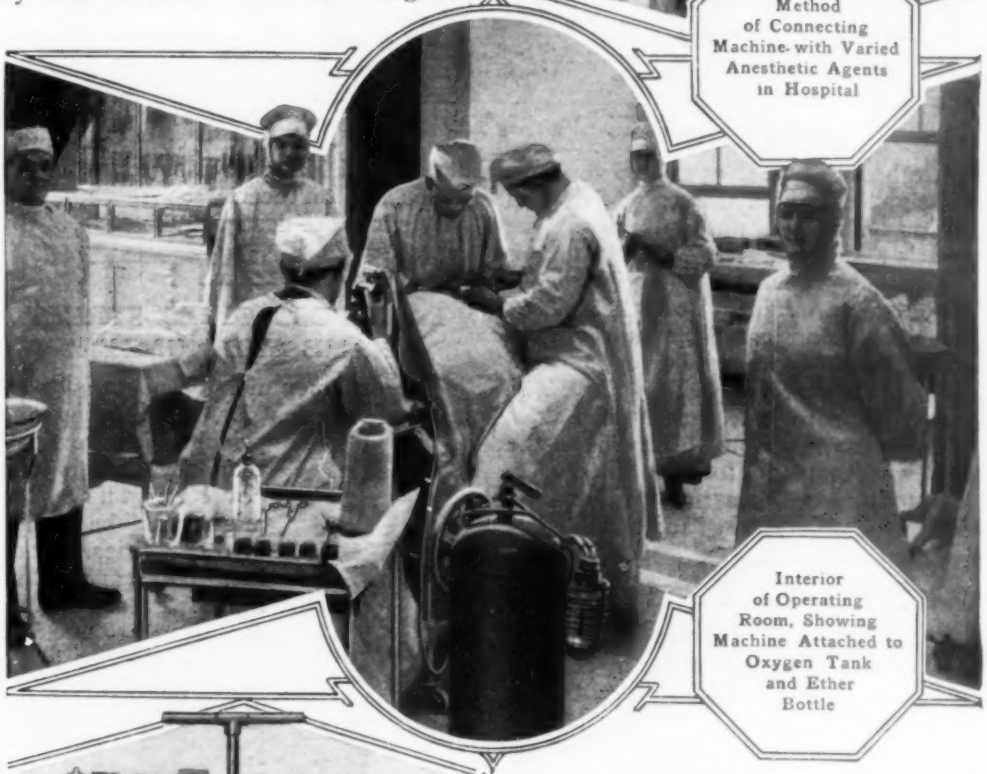
ANESTHETIZING MACHINES AID SURGEONS

Machines for administering ether, chloroform or other anesthetics have been devised, which make the work of the surgeon easier and safer for the patient. An improved machine is being used in several eastern hospitals which is motor-driven and seems destined not only to simplify present methods of anesthetizing, but to open a field to

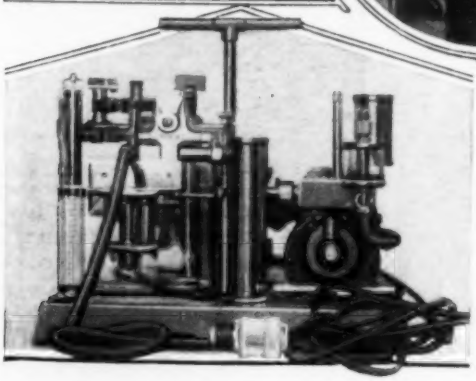
surgery which heretofore has been almost beyond the reach of the knife. With the new machine it is possible to maintain normal lung pressure while the chest cavity is being explored, a problem solved as a mere by-product of mechanical anesthesis, while the patient is freed from distress as the effect of the drug wears away. Gas and air, and gas and oxygen may be given instead of ether, or chloroform or ether in any predetermined amount supplied by this machine. Eminent surgeons believe this method of anesthesia has a wide and varied field.



Method of Connecting Machine with Varied Anesthetic Agents in Hospital



Interior of Operating Room, Showing Machine Attached to Oxygen Tank and Ether Bottle



Motor-Driven Machine Used in Administering Anesthetics in Hospital

¶A train 110 miles long, say the experts in the Department of Agriculture, would be required to haul the water in the corn shipped in one year by farmers. Only a few large elevators have equipment for drying corn before shipment and consumers are required to pay freight on 436,682 tons of water contained in corn under present conditions.

HOUSEBOAT DE LUXE WITH GASOLINE ENGINES

Substantially equipped with salons, state rooms, and observatories, a

Floating Bungalow Ready for a Long Trip

house boat 100 ft. long and 23 ft. wide, is being built in a Chicago boat yard for long lake, river and gulf trips. The boat is a side-wheeler, each of the two wheels being operated by an independent gasoline engine. It is heated by hot water, illuminated by its own generator and storage batteries, and carries its own refrigerating plant. The owner plans to tour the Great Lakes, to make the trip from the Lakes to the Gulf, and to visit Florida points. Accommodations for a party of six besides a complete crew are provided.

CONCRETE TANK FOR TESTING WATER METERS

A concrete tank, 400 ft. long, 6 ft. wide and about 7 ft. deep, and built without a joint, has just been completed for the use of the Bureau of Standards at Washington, D. C. This tank will be filled with water and used for calibrating water meters, a track being provided along the side of the tank on which a car, carrying the meter to be tested, will travel.

¶That the proprietors of one restaurant understand the principles of conservation is indicated by the fact that they have adopted the plan of printing their menu upon the paper napkins served to their guests.

SAND-BLAST ACTION OF DESERT WINDS

Overhead wires erected in Egypt in the vicinity of African deserts suffer from the sand blown about by the winds. Trolley wires of bright hard-drawn copper are so greatly reduced in six months that they frequently break and fall. Investigation showed the filing action of sharp sand particles driven by the desert winds which sweep across the right of way cuts the copper like a sand blast. Glass globes on arc lamps, and on incandescent lights, likewise show the destructive action of the desert sands.

LAMP-POST GIVES STREET NAME AND NUMBER

The ornamental lamp-posts adopted in Los Angeles for illuminating the principal streets of that city contain one novel feature that might well be copied in other cities. Each lamp-post carries five lights. Placed around the central one, in such a position as to be clearly illuminated by the rays, is a sign bearing the name of the cross street and the corresponding street number.

¶On July 22, 1913, a production of 30 tons was obtained from the well Henryk No. 1, in the Tustanowice field of Galicia. The well is 1,766 meters in depth, or 1 mile 513 ft. It is the deepest producing oil well in the world.

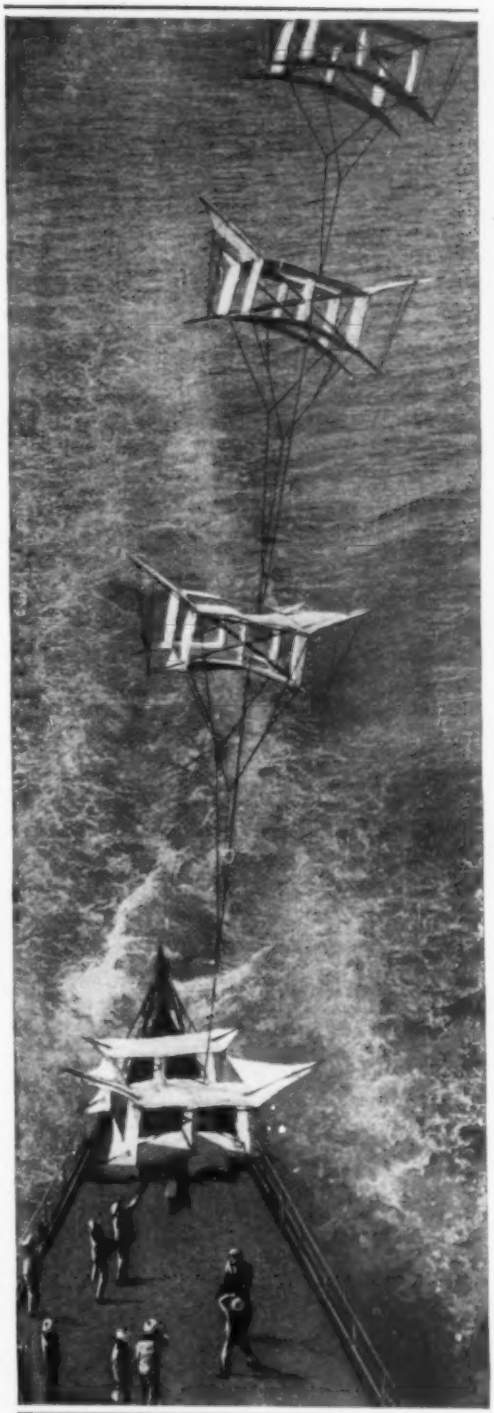
FRENCH NAVY TO USE KITES FOR RECONNOITERING

A cage supported by a series of kites flying one above the other, and used for carrying a trained observer, is one of the latest additions to the French navy. This method has been tried with some success in the reconnoitering work of the army, and its adoption by the navy is part of a complete organization of the aerial service. It is the purpose of the naval authorities to limit the use of aeroplanes to coast service, and to employ dirigibles in coast defense and long-range observations. For reconnoitering at sea, for illumination during naval maneuvers, and for such purposes as scouting along a blockaded hostile coast, the kites will be used. Each kite consists of a cellular plane, the number used depending on the force of the wind and other conditions. The kites are connected together by strong ropes and are flown one at a time from the deck of the vessel, and when a sufficient number have gone up, the observation cage, suspended from the kite cable, is released.

PLATINUM-PLATING IS NOW PERFECTED

Plating which will maintain its brilliancy, and which is almost everlasting, is now done in platinum, by an improved process which permits its being done on a practical scale. Platinum-plating is not new, but heretofore the plating has been too dark, with too much the appearance of steel to be satisfactory. The new process is applicable to electrical apparatus, small parts, screws, and joints, as well as to jewelry, and the finished article is bright, and nontarnishable. Many platers have been studying this problem and the new process will doubtless arouse much interest.

¶Antishark fishing nets, shaped like open umbrellas and closed by halyards, are being tested to protect the catch from sharks.



Courtesy L'Illustration

Kites for Carrying an Observation Cage Ascending from a French Warship

CEMENT SHELTER FOR SIGNAL MEN

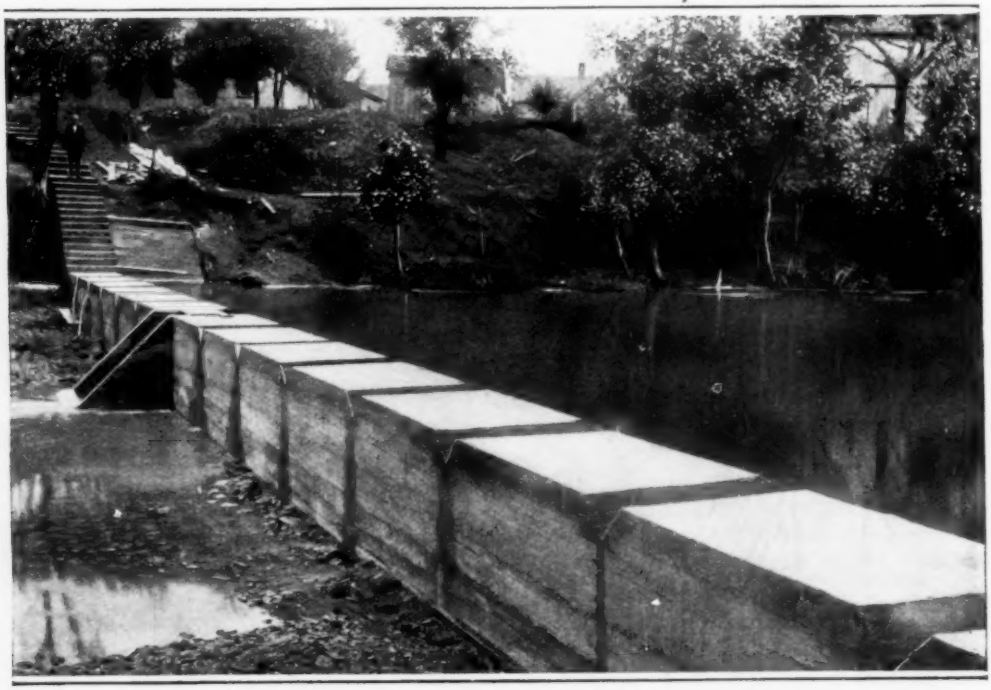
Protection from winter's cold and summer's heat is afforded the signal

Cozy Shelter Built of Concrete

men of one northern railway by means of snug houses constructed of concrete. Built in octagonal form, with windows all the way around, these shelters give ample light and air, with adequate protection against weather conditions. They are 8 ft. 2 in. in diameter, and 8 ft. high. The walls are 4 in. thick, and a 6-in. floor gives solid foundation for the structure. Floor, walls, and roof are solid concrete, forming a substantial, economical, and neat shelter.

CITIZENS BUILD CONCRETE DAM IN 44 HOURS

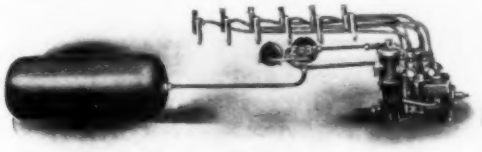
Across the Mississineva River, citizens of an Indiana town have built a concrete dam for the purpose of making a lake and pleasure resort. It is 125 ft. long, with two 10-ft. wings on each side; the base is 12 ft. wide and the top, used as a sidewalk and promenade, is 4 ft. in width. Spillways are placed at intervals along the top, and in the center an opening is made for a fish ladder. The entire work was done in 44 hours by a large force of public-spirited citizens as a matter of civic pride.



Concrete Dam Built by Citizens' Coöperation in 44 Hours

SELF-STARTER OF NEW TYPE FOR AUTOMOBILES

A self-starting apparatus, to be used with four-cycle motors and operating on a new principle, has been brought out. With this apparatus, compressed air, with which the proper amount of fuel is mixed, is forced into the cylinder. In this way the compression stroke of the four-cycle engine is automatically furnished before the engine itself is in motion. With this charge in the cylinder the engine is started simply by turning on the ignition. The apparatus consists mainly of an air compressor, a storage tank for compressed air, and an automatic carburetor which is entirely independent of

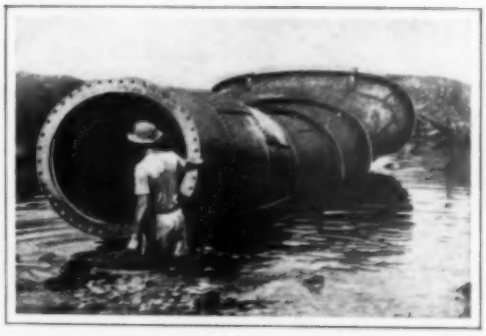


Pneumatic Self-Starting Apparatus with Connections for 6-Cylinder Engine

the main carburetor of the engine. The entire starting system is controlled from the selector valve mounted on the dashboard and fitted with a removable handle. By shifting the handle to different positions the compressor is connected with the engine or is disconnected, or air pressure direct from the compressor may be procured for inflating the tires. The handle is 2½ in. long and of such shape as to be carried conveniently, and when it is removed no one can tamper with the starting equipment in the absence of the driver.

FLOATING HEAVY IRON PIPE

A perplexing problem was quickly solved by a New Orleans contractor recently when a 54-in. drainage pipe was being installed beneath a concrete bridge and the pipe could not be lowered into place. The pipe weighed four tons, but the contractor noticed that it was sufficiently curved on the under side to float like a boat on the water.

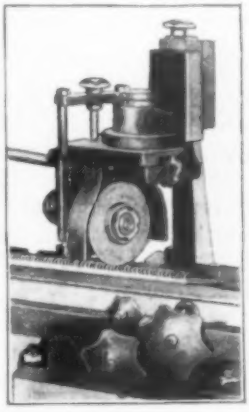


Four-Ton Pipe Floating on Water

One man was able to steer it around into position and the upper end was then raised with a hoist and bolted into place.

A FILE THAT CAN BE RESHARPENED

The discovery that the milled curved-tooth file, which has come into quite general use since its invention in 1900, can be resharpened as easily as a milling cutter is considered an advance in shop practice greater than the invention of the file itself. The fact that in the making of the curved-tooth file each tooth is cut and milled separately suggested a method of resharpening similar to the original cutting, and a machine has been devised for the purpose. This file-sharpening machine consists of a small fine-grinding wheel which operates in an adjustable arc to conform to the curve of the teeth. The file to be sharpened is fed through the machine by a small hand wheel in front, and the grinding wheel is passed through each tooth in turn by means of a guide lever attached to the wheel mounting. Resharpening will increase the life of a file considerably.



FIRST GOLD FROM NEW ALASKAN FIELD

The pan shown in the picture contains 205 oz. of gold, representing the work of two men for four days in a new field in the Shushanna district, Alaska. This find marked the beginning of a spectacular rush to the new diggings, which have proved a highly productive field. Pure gold is worth $20.60 an ounce, and this gold, while not pure, still carries a value of from $17 to $19 an ounce, making the day's work of each man worth approximately $480, which in these days seems at least fair wages.

First Gold from New Alaskan Field, Worth About $3,895, Cleaned Up in Four Days by Two Men

AN EFFICIENT HEN BREAKS WORLD RECORD

In the space of 345 consecutive days, 20 less than a year, an industrious hen, designated as "C-251" by the Oregon Agricultural College, broke the world's record for a full year recently, by laying her 285th egg. Hitherto 282 eggs for a full year had been the topnotch of efficiency in the annals of hennery.

¶"Ferro-cement," a mixture of "iron straw" with cement mortar and sand, is being tested in France as a road material.

DENVER MARBLE FOR LINCOLN MEMORIAL

The white marble of which the great Lincoln Memorial is to be built on the banks of the Potomac, in Washington, is to come from the Sopris National Forest Reserve, Colorado. This is probably the first great building in the East to be constructed of this stone, known to the building trades as Denver marble. The marble quarries are in the midst of the national forest on private land secured under laws by which areas bearing deposits of building stone are disposed of by the government. The country in which the marble deposits occur is extremely rough and precipitous and for a long time was inaccessible because of a lack of transportation facilities.

LONDON SIGNS DISPLAYED FOR AMERICANS

The attitude of English shopkeepers toward Americans is illustrated by the signs in the accompanying photographs. The finish of a shop that did not want American trade is set forth in the

The Failure of an English Business Experiment Illustrated by Signs

Photos by Underwood & Underwood

Sign Especially for the Benefit of Americans in London

A Steam-Driven Dumping Truck Which Uses Coke as Fuel

picture of the window of a bric-a-brac shop on Bayswater Road near Marble Arch, London. The little placard, "Americans are not wanted here," followed soon by a "Shop-to-Let" notice, tells its own story. That English and American are two different languages, at least to the English mind, is shown by the other picture. The sign, "American Spoken Here," enforced by a shield of the Stars and Stripes for tourists who cannot read English printing, hangs over the door of a tobacco shop in New Oxford Street, London.

STEAM-DRIVEN DUMPING WAGON

A new dumping wagon that is being built in France differs from other types in many ways. It is driven by steam, generated by a coke fire, and is automatic in every way and very simple to run. The steam boiler, which is carried in the driving cab, has automatic water feed and by means of superheating is very economical. The coke fire which heats it is automatically stoked. The truck is driven by a four-cylinder, tandem-compound engine. The drive is direct and requires no gear changing; power is transmitted from the main shaft on which the cranks operate by pinions to the differential and by chains to the rear wheels. All control is secured by the engine throttle. The body of the truck tips to right or left and is operated by a hydraulic ram.

ORNAMENTAL DOG KENNEL MADE OF CONCRETE

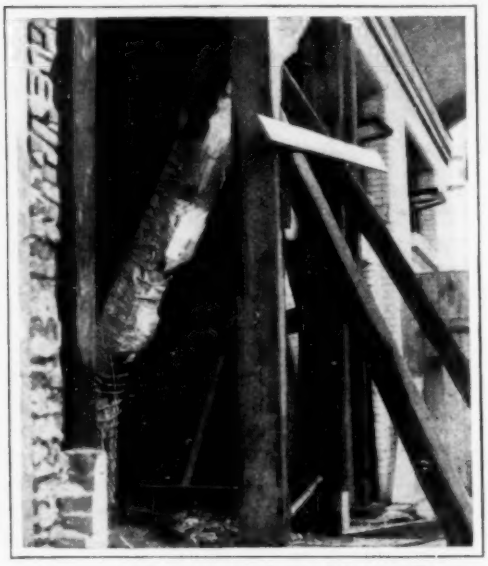
This combined dog kennel and garden vase ornaments the lawn of an ocean side home in California. From the standpoint of beauty and utility this concrete structure, with its bowl of growing flowers and plants, solves the problem of those who wish to keep a pet, but dislike the sight of an ugly wooden

A Comfortable and Sightly Concrete Dog Kennel

kennel in the yard. The kennel is cool in summer, and may be washed down with a hose without in any manner impairing its beauty or damaging the structure. In winter it affords a better protection than a wooden kennel, for no winds can force their way through these solid walls.

A TEST OF REINFORCED-CONCRETE PILLARS

Reinforced-concrete pillars were given an unexpected test in Montreal



A Concrete Pillar Which Turned Aside a Heavy Runaway Tank Car Traveling at High Speed

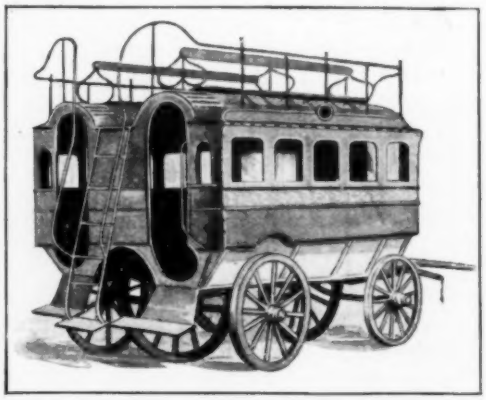
not long ago. One of them proved strong enough to turn aside a heavy tank car traveling at high speed. The car, loaded with tar, broke loose at "Mile End" station and ran away down a grade into the Place Viger station, two miles away. It left the rails at the latter station, cut deep furrows across the cement floor of the concourse, crashed through a stone and cement wall, and stopped in the middle of the waiting room. The hole it made in the wall is shown in the accompanying picture. The big concrete pillar, which stood in the car's path, did not break, but bent inward, sending the car sideways into the waiting room.

GERMAN AIRMAN BREAKS WORLD'S RECORD

A German airman flying in a 100-hp. biplane broke the world's record for distance covered within 24 consecutive hours when, on October 15, 1913, he flew from Johannisthal to Mulhausen, Germany, in competition for a prize offered by a German association. The distance covered was 1,376 miles. The flight was completed within the time limit, with an actual flying time of 22 hours 47 minutes.

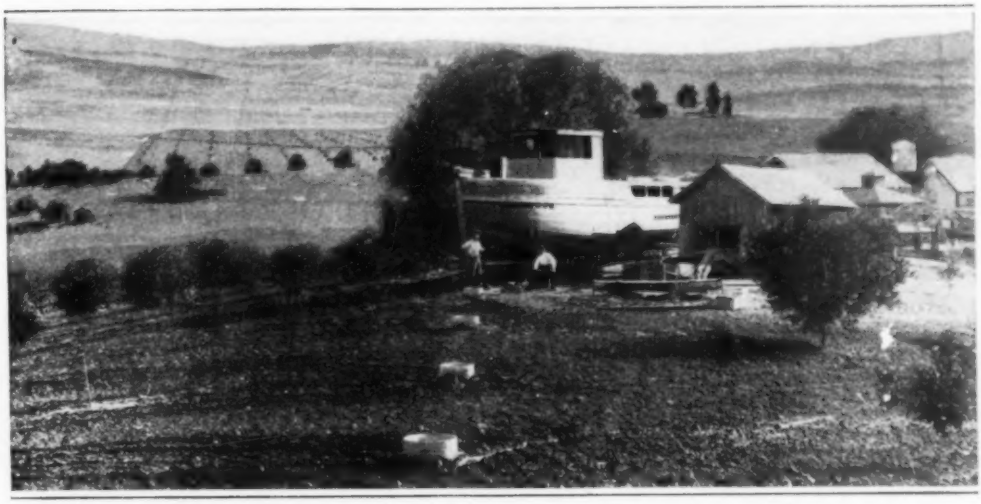
REMARKABLE OMNIBUS USED IN PARIS 50 YEARS AGO

That all styles begin in Paris was as true 50 years ago as today, but the peculiar omnibus shown in the illustration happened to be one of the styles that didn't "take." It was designed by a wagonmaker of Bordeaux for service in Paris, and accommodated 52 passengers, 28 in the interior and 24 on the roof. Six wheels supported the vehicle, which was drawn by three horses. It proved no success, however, on account of the crowding of the interior and lack of fresh air, and its old-fashioned rivals continued to draw the patronage until they were superseded by the modern auto busses, while the "double-tricycle omnibus," as it was called, was withdrawn from service.



Double Tricycle Omnibus Used in Paris Half Century Ago

LARGE VESSEL BUILT ON A MOUNTAIN

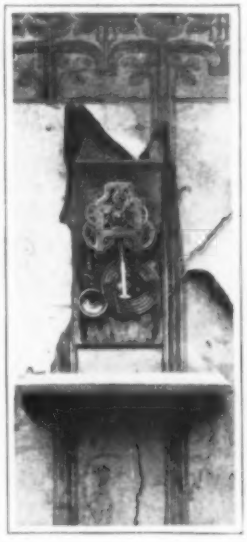


A Sea-Going Vessel That is being Built on a Mountain, 40 Miles from the Sea

On a mountain top in California, 40 miles from the seashore, several men are building a boat large enough to take them around the world. Their shipyard is behind a ranch house, 1,000 ft. above sea level, overlooking La Habra Valley. When the vessel is completed it will be transported to the coast on two caterpillar engines and everything except its gasoline-power plant will be installed before it makes the trip. The boat is being built to carry seven men on a trip of adventure around the world for the purpose of writing magazine stories and taking moving pictures. It is 62 ft. long, contains six large rooms, and is being equipped with a view to long journeys in out-of-the-way parts of the world. Its storage tanks are large enough to carry 2,500 gal. of gasoline and 1,000 gal. of fresh water. Apparatus for distilling sea water and a high-power generator for supplying electric light are included in its equipment. To prevent an epidemic of scurvy, large boxes of earth are being provided for growing green vegetables at sea. A mounted machine gun will be carried in anticipation of trouble in uncivilized islands. The vessel will cost about $7,000 and will be launched in 1915. The first part of its journey will take it through the Panama Canal and a trip up the Mississippi will be taken before it starts around the world.

HURRICANE BLEW DIAL OFF THIS CLOCK

A peculiar freak of a Colorado hurricane is shown in the illustration. The clock dial was of ordinary lightweight zinc, attached to the wooden frame with 2 ¼-in. screws. The storm broke at 1:06 p. m., and the wind which wrecked the house tore off the outer case of the clock, ripped the dial as well, but did not disturb the hands, which may be seen pointing to the minute and hour of destruction.



HUNTING THE FRESH-WATER PEARL

By TOM SHIRAS

The fresh-water pearl fisher is a true gambler. The chance that he will find a fortune in a season lures him into malaria-ridden swamps, along mosquito-infested rivers, always hoping. Sometimes when the glow of fever is on his cheek, with hands festered and sore from opening countless shells, with aching back, fortune smiles on him and he picks it, trembling, from between two shells. He shouts his good luck to his fellow workers and chance takes another opportunity to lead them further into the game. All the chance and romance of the pearl-fishing industry does not center around the coral reefs of the South Sea islands. There are thousands of people working every day during the spring, summer and autumn months in the pearl-bearing streams of the United States gathering the fresh-water mussel from its bed of sand for the jewels it produces.

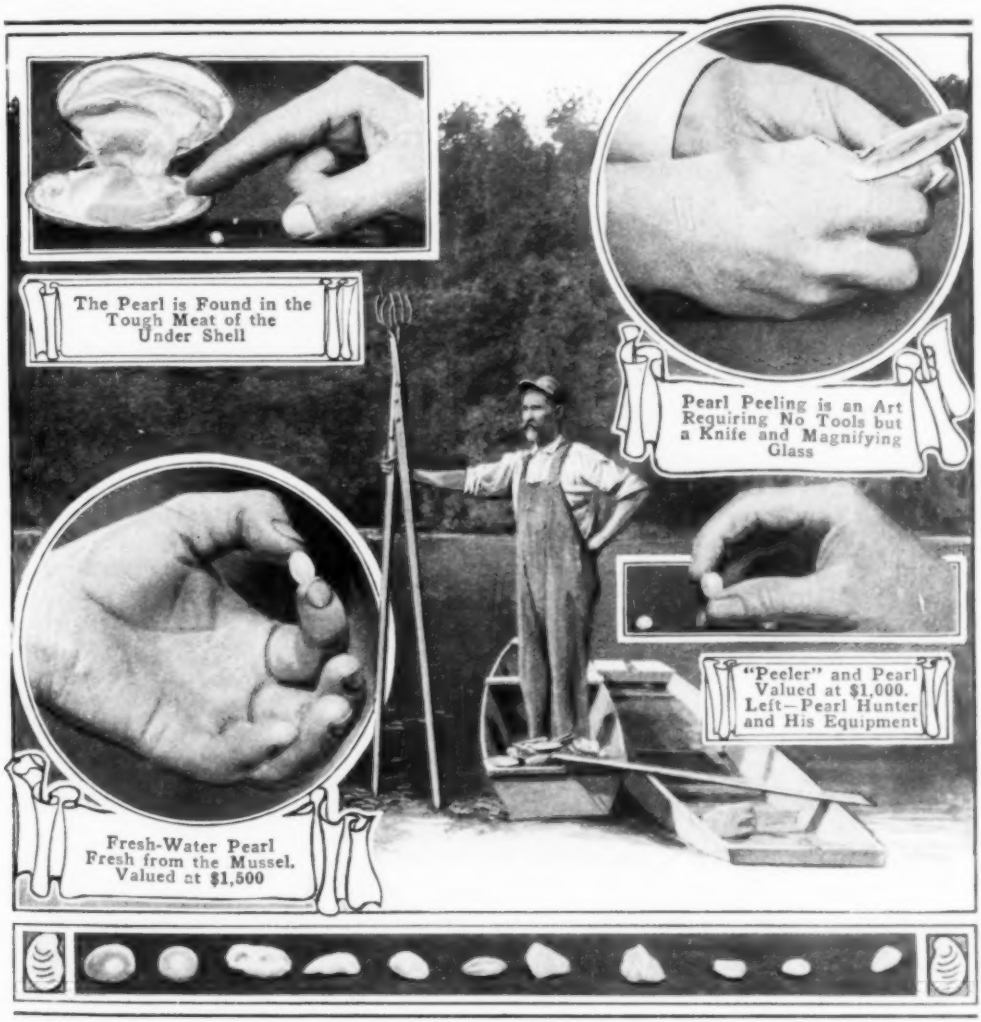
The fresh-water mussel for years had no known value except for fish bait. It propagated in peace and the species grew prolific. During the past decade, however, it has furnished parts of the South with a brand-new industry that employs hundreds in its different branches. The industry has developed chiefly along the Mississippi and its tributaries, and the value of the pearls found in that section now runs into thousands every year. Not only does the fresh-water mussel furnish milady with glistening jewels for adornment, but with buttons as well and many other articles, made from mother-of-pearl, that find their way to her dressing table.

The real value of the fresh-water pearl production in the United States has never been computed with any accuracy, owing to the fact that definite information is not available. Generally speaking, the true value of a pearl is never known until it is sold at some point remote from where it was found. Not only is there a great element of speculation in the pearl buyer's trade or profession, but business considerations generally require of buyers a certain degree of reticence in regard to the value of their purchases. The price of a pearl in even those localities where pearls are found every day, where hundreds are engaged in the work and where both the fishers and the buyers are the most experienced, may in the course of a few weeks double or decrease in a corresponding ratio. The real value of a pearl is based on the fancy of the purchaser and the greed of the seller.

Roughly speaking, there are four classifications of fresh-water pearls—true pearls, baroques, slugs, and "chicken feed." The true pearl is of a definite, regular form, round, oval, pear-shaped, drop, button, etc., and commands the highest price if it possesses the desired luster and translucence, together with proper color. Slight imperfections, such as pin holes, rough places or lusterless areas, will materially affect the value of the piece. Baroques are pearls of irregular form having other good qualities to make them suitable for use in jewelry of high class. The best grades of baroques may command very high prices, surpassing regular pearls of equal size which are wanting in luster, or otherwise slightly imperfect. Slugs are the lower grades of baroques and come next lower in value. The price varies from a few cents to several dollars. By far the greater number of pearly formations are slugs, a large number of which, from their small size, are classed as chicken feed and are sold by the ounce at prices varying from one to three dollars. There is one other classification of fresh-water pearls, known only to the buyer, and that is called the "peeler." It is nothing more nor less than a true pearl of poor luster, or otherwise imperfect, which apparently has only a small value, but which in the hands of an expert peeler may

show a jewel worth a small fortune when the exterior is peeled away.

Pearl peeling is an art. Pearls are formed layer by layer. A small piece of sand, or other foreign substance, gets into the shell and the mussel can-


The Pearl is Found in the Tough Meat of the Under Shell
Pearl Peeling is an Art Requiring No Tools but a Knife and Magnifying Glass
"Peeler" and Pearl Valued at $1,000. Left—Pearl Hunter and His Equipment
Fresh-Water Pearl Fresh from the Mussel. Valued at $1,500

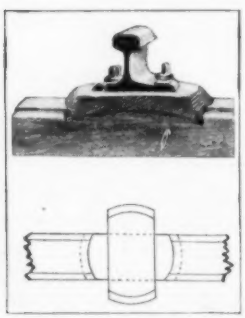
not throw it off, so it does the next best thing; it starts to cover it with a smooth, pearly covering, and the pearl begins to form. Expert buyers say that the mussel puts on a layer each year. Many times, half of the layers that go to make up a perfect pearl, starting from the center, will be laid down smooth and regular, with a fine, clear luster, when an atom of foreign substance will fasten itself to the forming jewel. The next layer will then be irregular over this, as will each succeeding layer, and this will give the pearl an imperfect shape and reduce its value. Nine times out of ten the luster will be poor from the start of the irregular layers. Right at this point the skill of the peeler comes in. Not only must he be an expert, but if he be a buyer as well, he must have that instinctive knowledge that goes with the successful ones in the trade, as to just how far that imperfection extends into the jewel. Strange to say, the only tool used by the pearl peeler

is a pocket knife. For an extra-good knife with traits peculiar to the needs of the trade a pearl peeler will pay many times its intrinsic value. A steady hand is also a requisite, as a slip of the knife may cause the loss of a thousand dollars that can never be recovered, for the layers are as thin as the shell of a humming bird's egg and very brittle. Each layer has to be taken off in its entirety without scratching the one beneath. The touch has to be as light as that of an artist retouching a photographic plate, and the peeler must know when to stop. Pearl peeling is as much an art as diamond cutting, and the man who knows his trade commands a standing among those engaged in the profession, as high as the expert diamond cutter does in the diamond trade.

Fresh-water pearls have a much higher relative value than is commonly known. For a long time the value of such pearls was discounted on account of their known origin, and in order to be sold they had to be represented as Oriental pearls, and many of the best fresh-water pearls in the United States have been sold under that false classification. Within the past decade, however, owing to the persistent efforts of certain leading jewelers in the East, fresh-water pearls have become better known and have assumed more and more their true economic rank. There are over 500 varieties of fresh-water mussels in North America and a considerable number of these yield pearls of more or less value. External conditions have much to do with the quality and quantity of pearls formed. The mussels are generally found near the banks of the stream in shallow water, buried in the sand or mud, or in the tributary sloughs and swamps. They occur in beds of greater or less magnitude. The industry of pearl fishing can be compared closely to placer mining for gold. It is the property of the United States the fisher is working on and the government demands no royalty. One can start in with a gunny sack, a sharp stick and an old knife. He may work 10 years and never find a pearl worth two dollars. Again there is that chance—that rare thousand-to-one chance—that the first shell he opens will yield a fortune. The beds in deep water are reached by the use of tongs, made like pitchforks and fastened together like scissors. It is the dirtiest kind of wet, muddy work and only the lure of sudden fortune keeps men working at the industry.

HARDWOOD TIE PLATES ON EUROPEAN RAILWAYS

The forests are going. The demand for wooden sleepers is growing in all civilized lands. It is necessary to increase the length of time the old wooden ties can be used, and to solve this problem, experiments have been made on some continental railways with hardwood tie plates, set into the old ties in such a way as to prevent mechanical wear and tear on the rail, while improved pickling methods render the soft wood of the sleeper practically immune to attacks of fungi or dampness. The hard wood, and this is also taken to mean a wood mass powerfully compressed hydraulically, in the shape of pads, either wedge-shaped or circular with a bevel, is set into the seat which has been cut in the sleeper, which is filled with a hot, tarry mass, and turned by suitable force until its longer side is at right angles to the center line of the sleeper. This distributes the cementing material, and makes it fill any existing small gaps. Thus no water can penetrate the joint, while at the same time an elastic intermediate layer is provided. The pads are interchangeable, and easily replaced with new.

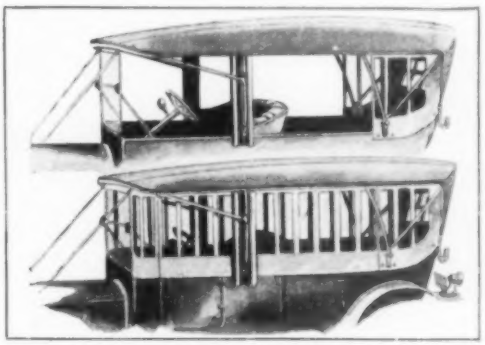


KEEPING ACCOUNT IN THE GAME OF WAR

The intricacies of mimic warfare are well shown in the scheme devised at Aldershot to keep track of the theoretical dead and wounded in battle. Hundreds of printed slips, marked "dead," or describing wounds usually received in battle, are distributed according as the game grows hot or cold. The man receiving the slip must instantly fall out and remain on the ground until the arrival of the ambulance corps. If "dead," a record of his demise is made and he is allowed to go to the rear. If "wounded" he is taken off the field and treated in accordance with the nature of his "wound."

CURTAINS FOR AUTOMOBILES AFFORD COMFORT

A curtain of new design has been placed on the market which may be used on any car, making a limousine out of a touring car with small trouble or expense. The fixtures consist of a single pair of double-channel cases, or housings, made of pressed sheet metal, one for either side of the car, and each containing two all-metal rollers on which the curtains operate automatically. The fixtures may be attached

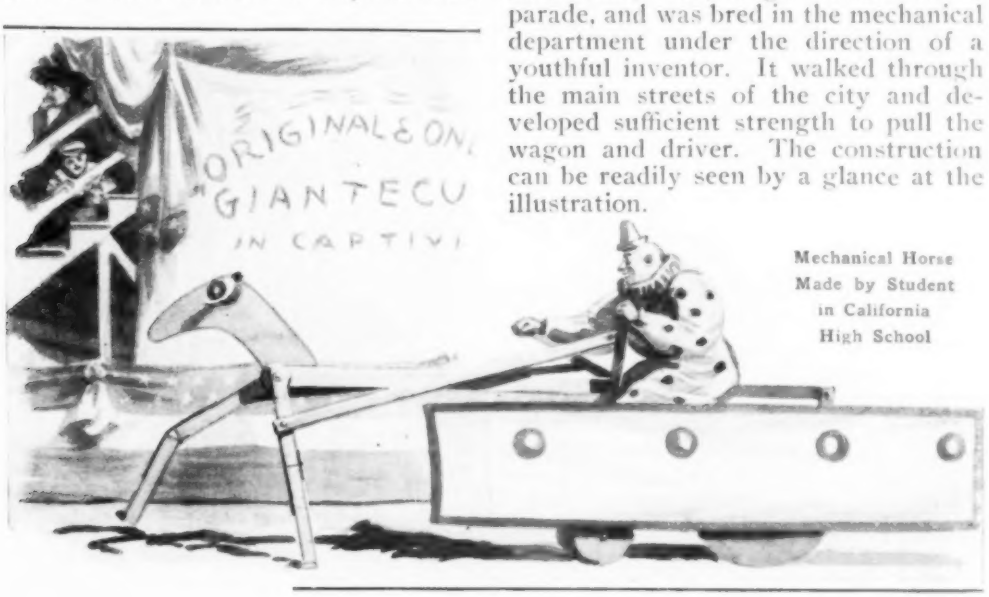


Convenient Curtains for Automobiles

or removed quickly without leaving the car, and all curtains are operated and fastened entirely from the inside, the front ones being drawn forward and the rear curtains drawn backward from the metal containers. The transparent portions are made of celluloid, extremely flexible, and the whole is convenient and of good appearance.

MECHANICAL ANIMAL IN HIGH-SCHOOL PARADE

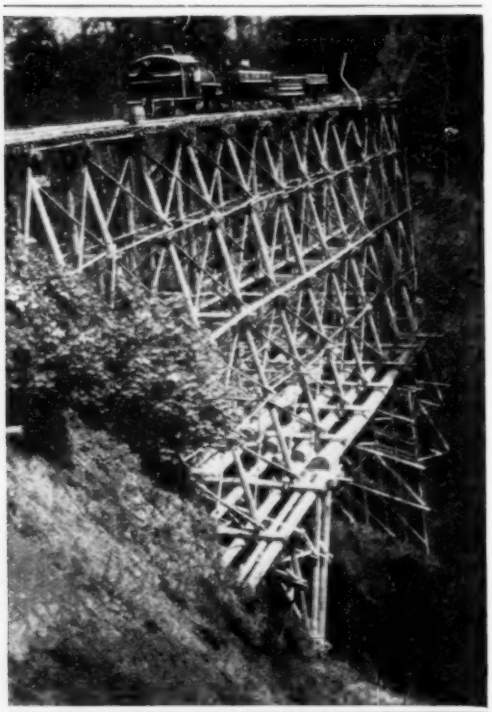
This animal was a feature of the Richmond, Cal., High School circus parade, and was bred in the mechanical department under the direction of a youthful inventor. It walked through the main streets of the city and developed sufficient strength to pull the wagon and driver. The construction can be readily seen by a glance at the illustration.



Mechanical Horse Made by Student in California High School

INTERESTING CONSTRUCTION OF RAILWAY TRESTLE

An unusual combination of cantilever and arch action is employed in a wooden railway bridge over the Baker



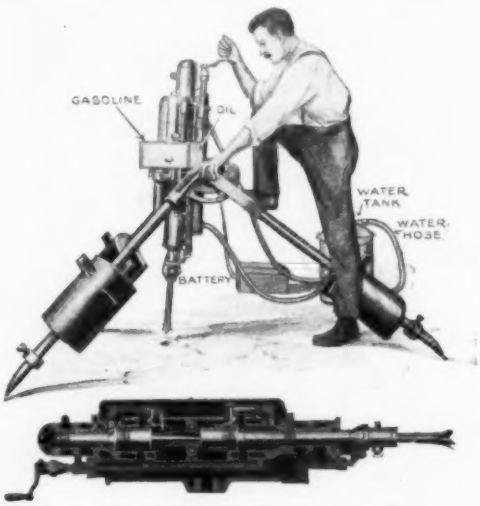
Railway Trestle in Which Arch and Cantilever Action are Combined

River, in Washington, where the track crosses the canyon at a level of 180 ft. above the water. The upper half of the bridge consists of a two-story trestle of the ordinary type. The lower half, or base bridge, which is the feature of the structure, has a total length of 160 ft., with a central beam span of about 80 ft. This is supported on two wooden piers each containing several bents, with footings near the bottom of the canyon, and leaning outward from the canyon wall. These bents are framed of 24-in. fir logs. On these a framework of log beams is laid. The beams forming the central span are 48 in. in diameter, and serve to take the thrust of the inclined bents, resulting in an arch action, while the beams of the end spans project beyond the bents and form a cantilever that takes part of the weight of the upper half of the structure.

All timbers were cut and framed in the woods close by. This bridge is a temporary structure, and will be used as a falsework when the time comes to replace it with a permanent bridge.

IMPROVED GASOLINE ROCK DRILL

An improvement in gasoline drills has been patented in which the piston rod, pistons, and bit are all connected together, forming a direct-striking piece, acting and striking the rock in the same manner as the air and steam drills, but impelled by gas explosions. The motive force of this drill is furnished by two cylinders opposed to each other. A piston rod, fitted with a piston for each cylinder, and on the end of which is a bit chuck, continues through the two cylinders. Make-and-break spark plugs are tripped and fired by each cylinder alternately. The firing of the rear cylinder drives the piston and bit forward, hitting the rock with all the force of an explosion of gasoline. The front cylinder then fires, and the piston is sent back to its first position, lifting the bit power-



New Gasoline Rock Drill Entirely Self-Contained

fully and quickly. The illustration shows an entirely self-contained drilling unit, unhampered by the usual equipment of steam boilers, air compressors, or piping. Three gallons of gasoline are amply sufficient for 10 hours' continuous drilling.

GERMANY PUSHES WIRELESS TO AFRICA

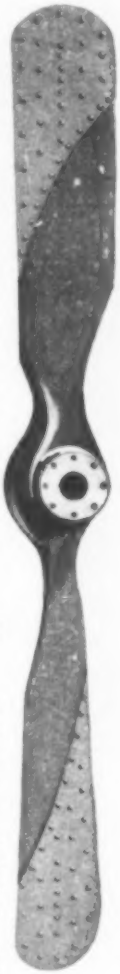
The German Postal Department announces that wireless service to the German African colonies will be ready by May, 1914. Work is going on day and night on the erection of towers from 400 ft. to 828 ft. high, the latter being second only to the Eiffel tower in Paris. Count Arco, the German wireless expert, is building the high-frequency machine for use in connection with the highest tower.

NEW COMBINATION LOCK FOR ORDINARY DOORS

A simple combination lock for the outside door of any residence has been placed on the market. It is adapted to any door, either right-hand or left. The combination may be changed eight times without removing the lock from the door. By removing the lock and altering the position of the rocker bars, thousands of different combinations may be had. The person knowing the combination can open the door in the dark in less time than it takes to get out a bunch of keys, select the proper one and open a lock of the common type.

REPAIRING THE PROPELLERS OF AEROPLANES

Since aeroplane propellers cost about $50 apiece and are easily broken, many attempts have been made to repair them. Of these the most successful has been devised by the owner of a flying boat. After he has trimmed away the splintered end of the broken blade he glues on a number of small pieces of wood, one after the other, and fastens them with small dowel pins. Over the end of the pieced blade, he fastens a piece of copper sheeting, riveted and soldered into place. Small holes have to be drilled in the end because the centrifugal force of a 7-ft. blade, with a speed of nearly 5 miles a minute at the tip, is sufficient to drive through the sheeting any water that gets inside of it.



NOVEL USES FOR THE TELEPHONE

The telephone is being put to many strange uses as a labor saver and an emergency aid. In the cost-keeping systems in many factories, the workmen do not keep their own time records, but telephone to the bookkeeper whenever they start or finish a job, so that he can make the entry. Automatic-telephone temperature recorders are used in orchards to save fruit crops from frost; when the temperature falls, the central operator is notified so that she can arouse the farm hands and send them out with smudge pots.

¶Motion-picture companies are making films of all the activities of the Federal forest service, including planting, cutting, patrol, and lookout work.

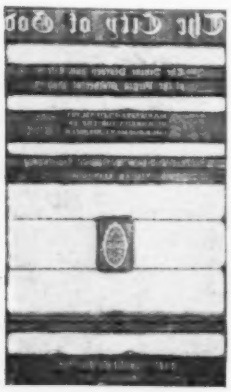
WINDSHIELD PROTECTS MOTORCYCLISTS

One great objection to motorcycling in cold weather has been overcome by the introduction of a windshield adapted to motorcycles. As seen in the illustration, the device consists of a small metal frame in which is held a sheet of transparent celluloid, such as is used in automobile curtains. The frame is fastened to the handlebars in a few minutes by means of adjustable clamps, and weighs but five pounds.

New Windshield for Motorcycles, Which Fastens on Handlebar

TIME-SAVING DEVICE FOR COMPOSING ROOM

When turning to the advertising pages of a newspaper one sees more or less white space, together with type of larger size than ordinary. This white space in display advertising is set, however, in the composing room and takes nearly as much time to set as if the space were filled with type matter. Quads or spaces of lead must be handled, set, and locked in the form. This is called "justifying the form." After use the quads are distributed, exactly as when type is handled. Thus display advertising matter is expensive in labor cost. A device has now been patented which saves a very large portion of this labor, by filling the spaces between lines of display type or around cuts with melted type metal. The pictures tell the story of the saving in time, labor, and type material, for the metal may be melted over and over, and used in linotype or monotype machines as desired. A man may, with this automatic justifier, do as much work in the composing room as three or four men by old-fashioned methods.



The Time was Reduced on This Job from 2½ Hours to 8 Minutes

Pouring the Hot Metal in Automatic Justification

Fifty-Nine Pieces, Necessary in Old Process, Dispensed with by New Method

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¶The total value of all products quarried in the United States during the year 1911 was, according to reports of the Bureau of Mines, $149,541,722.

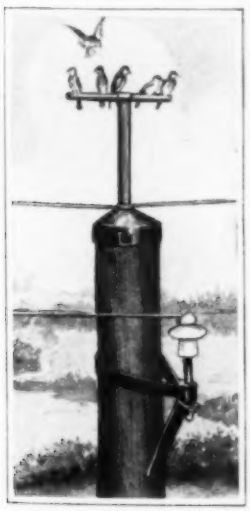
LONG-DISTANCE NONSTOP PASSENGER TRAINS

European railways have many more long-distance nonstop trains than America, the longest no-stop run in the United States being given as that from Englewood station, Chicago, to Fort Wayne, Ind., a distance of 141 miles, made at a speed of 59 miles an hour. Time tables show nonstop runs of over 400 miles in length, but these runs require stops for change of locomotives.

England, on the other hand, has three runs which are more than 200 miles in length without a single stop, and eight runs of over 150 miles, the speeds ranging from 50 to 58 miles an hour. Germany has five nonstop runs of over 150 miles, with speeds of 48 to 53 miles an hour, while France has only one nonstop run of more than 150 miles.

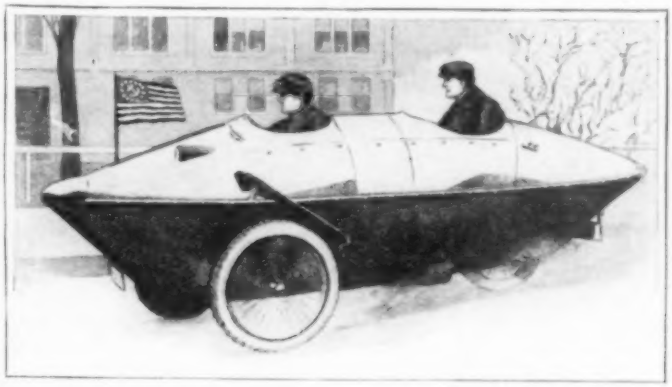
INSULATED PERCH FOR THE BIRDS

The regulations of the German Association of Electrical Engineers prescribe that the attachment of power lines to poles should not offer perching places for birds. This may be difficult sometimes, but the illustration shows a perch for birds insulated from the wires and offering a comfortable place for them.



MOTORCYCLE WITH BOATLIKE BODY

A motorcycle of unusual appearance has been attracting considerable attention while "navigating" the streets of Boston. In shape it resembles a submarine on wheels, and its owner says it is a practical winter motorcycle with a tri-car attachment.



A "Freak" Motorcycle That Navigates Boston's Streets

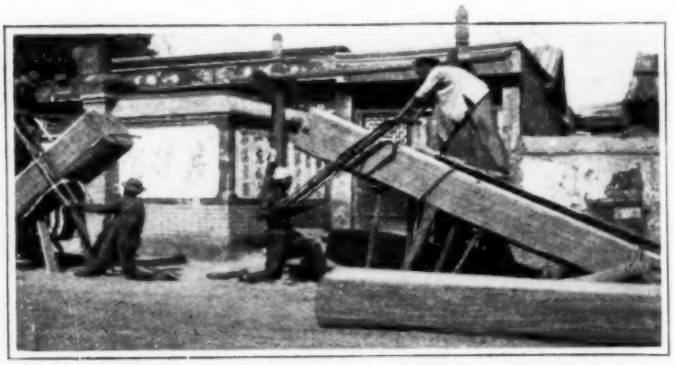
The body, which is constructed of sheet metal, is painted a bright yellow. At the nose, which might be said to resemble that of a fish, is a powerful electric headlight. Above, in the position of the eyes, are two electric lights, one red and the other green, and by arranging the circuit somewhat after the fashion of electric display boards, these eyes wink alternately while the machine is in motion. The mudguards are constructed to resemble fins. An American ensign is flown from the forward deck, and a big yellow pennant with the words "Yellow Jacket" usually flies from the aft deck.

As it would be rather unhandy to lift the machine up on its stand every time it is desired to start it, the inventor fitted it with a self-starter and a two-speed, free-engine rear hub, which makes it possible to set the machine in motion by pressing a small pedal.

¶A decorative park is to be laid out on the sloping backfill behind the Gatun locks and dam in the Panama Canal.

CHINESE WOOD SAWYERS EARN PITTANCE

All sawmills in China have for ages been run in the crude manner shown in the picture. It takes a long time to saw boards out of great logs, but the coolies work steadily all day long. The illustration shows a sawmill in the streets of Peking, and the men are rip-sawing the planks from teak-wood logs. For a day's work they receive from 12 to 15 cents each.



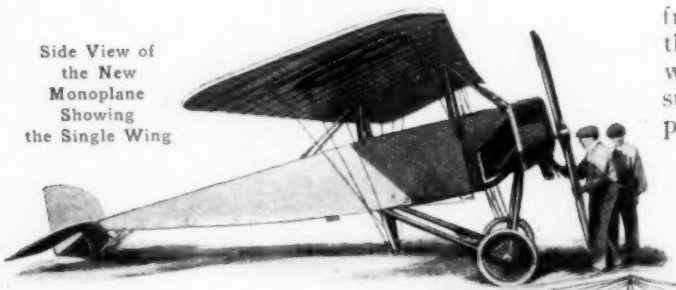
Chinese Wood Sawyers at Work

ELECTRIC LOCOMOTIVES FOR NEW YORK TERMINALS

Six of the most powerful electric locomotives in the world have recently been ordered for terminal service out of New York. Each of these locomotives weighs 110 tons, while the heaviest electric locomotives now in service, designed for hauling 1,000-ton trains in the same terminal service, weigh 100 tons. Weights of trains are constantly increasing and the new locomotives have been designed to haul approximately 40 per cent greater tonnage than this in continuous service. They will be able to haul a 1,200-ton train at a speed of 60 miles per hour on straight, level track.

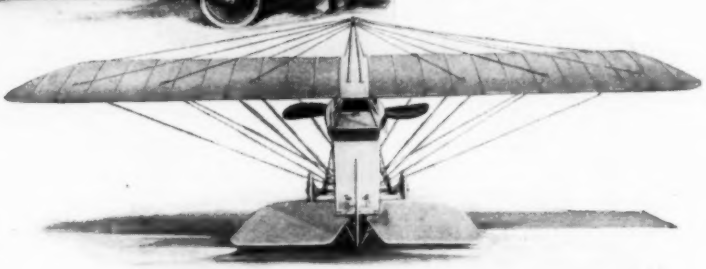
¶About 3,000,000 dozen eggs are eaten in Greater New York every week.

NEW MONOPLANE BUILT FOR SANTOS-DUMONT



Side View of the New Monoplane Showing the Single Wing

A new monoplane, which is proving exceptionally stable, has been built by a French concern for Santos-Dumont, who has recently taken out a license as a pilot. It differs from other monoplanes in that the wings, or rather wing, for the supporting surface consists of a single plane, is attached about 2½ ft. above the framework. The first trial at Villacoublay gave excellent results.



Rear View of the Santos-Dumont Monoplane, Showing Method of Guying and Staying the Single Wing

PLENTY OF STOVES BUT NO BRICK CHIMNEYS

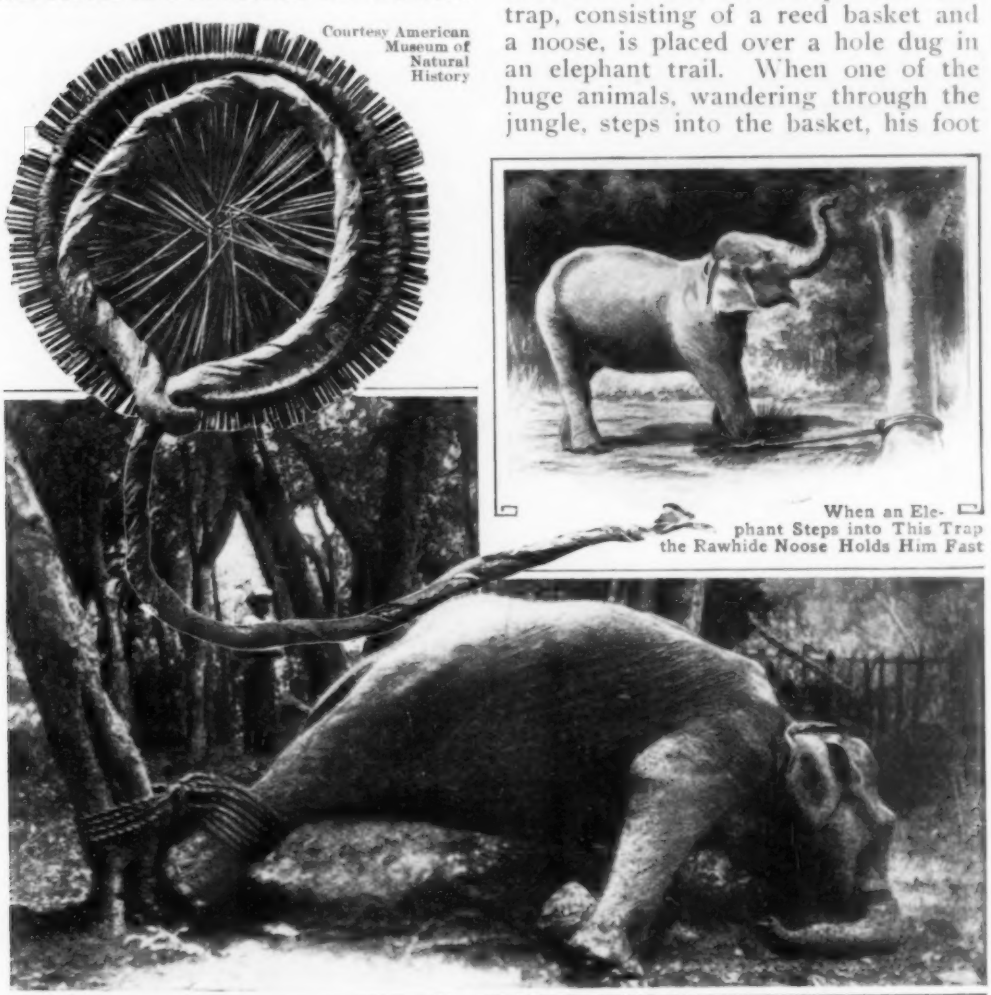
In interior Alaska there are no brick chimneys. The smoke from the countless stoves in that section is conducted from the cabins to the outer air by stovepipes, some of them 50 ft. in length. Creosote gathers in the pipes and eats the iron so that several changes must be made during the long winter. No clay for brick making has as yet been uncovered in Alaska, and the excessive freight charges on brick, due to the long haul, places the price at a prohibitive figure.

NATIVE TRAP FOR SNARING ELEPHANTS

A rawhide slip noose, arranged as in this picture, is used by the Kara Moja tribe of Africa to catch elephants. The trap, consisting of a reed basket and a noose, is placed over a hole dug in an elephant trail. When one of the huge animals, wandering through the jungle, steps into the basket, his foot crushes through the frail reeds. The rawhide noose, attached to a rawhide cable, draws tightly about his leg just above the foot and holds him fast. African elephants are killed for their tusks. In Asia they are tamed, the most difficult step being to lash the animal's leg to a tree. After the beast has tired itself out trying to escape the rest is easy.

Courtesy American Museum of Natural History

When an Elephant Steps into This Trap the Rawhide Noose Holds Him Fast



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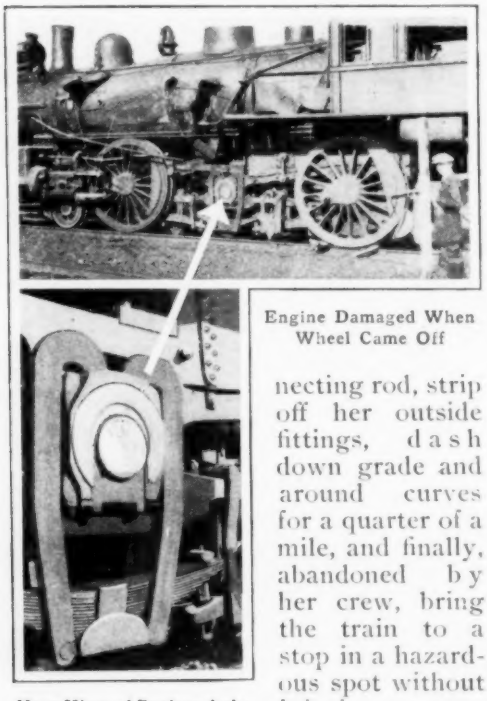
Remarkable Photograph of a Wild Elephant Lashed to a Tree until Its Temper Moderates

UNUSUAL LOCOMOTIVE ACCIDENT

That a locomotive running at 50 miles an hour can lose a main driving wheel, break her side rods and a connecting rod, strip off her outside fittings, dash down grade and around curves for a quarter of a mile, and finally, abandoned by her crew, bring the train to a stop in a hazardous spot without injuring a passenger or derailing a single pair of wheels, was demonstrated recently near Waterbury, Vt. This extraordinary accident was the result of a broken axle which snapped off at the journal box. Escaping steam and broken rods, flailing the cab, forced the engineer to jump after setting the brakes; and the fireman followed. The train comprised four cars and few passengers knew an accident had occurred until the train stopped. Apparently the broken axle was due to a flaw in the steel, and the illustration shows the crystalline structure as a light spot.



Engine Damaged When Wheel Came Off

Near View of Broken Axle, Showing Flaw in Steel

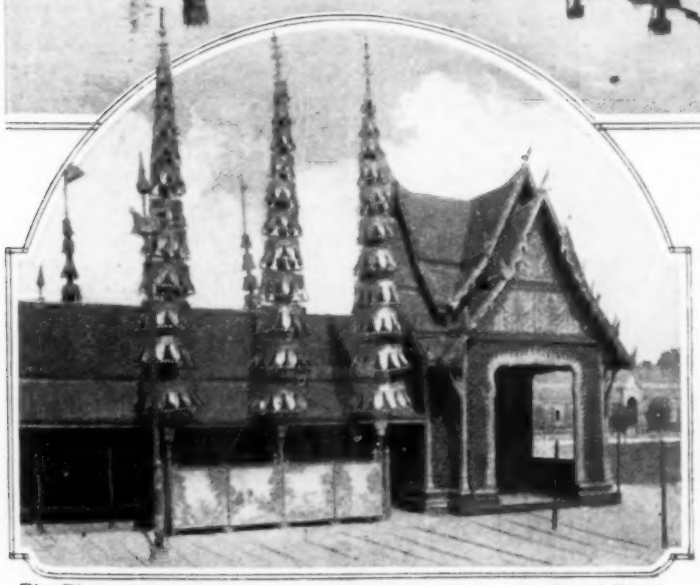
¶Carbon monoxide generated by a cargo of corn caused the death of a sailor who went into the hold of a ship at Liverpool recently.

ELABORATE FUNERAL RITES IN SIAM

The painting of a sacred "white" elephant for a Siamese funeral procession and some of the buildings and decorations used during the cremation ceremony are shown in the accompanying pictures. These and other preparations are considered necessary in Siam for a happy future existence. After death, the body, with a coin in its mouth for toll into paradise, is laid in a black coffin ornamented with silver paper in the principal room in the house, and the relatives keep a watch of one or two nights. A choir of monks intones sacred songs, a band plays continually to ward off evil spirits, and lamentation is kept up by relatives and hired mourners to pacify the ghost of the departed. After the watch, the body is taken to the temple to be cremated or to be left until the family has enough money for a cremation suitable to its social position. On the way to the temple the body is taken through a hole made in the side of the house, around the house several times, and finally three times around the funeral pyre to confuse the ghost so that it cannot find its way back to haunt its home but will go directly to heaven. Enormous amounts of money are spent for the immense pyre and the elaborate ceremony. Feasting, music, and theatrical performances go on for two days, and all relatives and friends are present with scented tapers, fireworks, and money for the poor. A large choir of monks sings continually and sometimes a man's entire estate is spent on presents for the choir and other ceremonies to gratify his spirit. Cremations are ordinarily held during a special season, usually in April or May, and bodies are held until this time. The cremation of members of the royal family, which are held at intervals of several years for those who have died since the last ceremony, are almost public festivals. They may last for a month, and during this time thousands of people are fed and entertained at royal expense. In

this case the bodies are not laid in coffins, but are placed in a sitting position in large copper urns in a shell of gold. Each stage of a royal cremation—bringing the body to the pyre, placing the body on the pyre, lighting the fire, burning the pyre, and collecting the ashes—takes place on a separate day. The king lights the pyre with sacred fire from a royal temple and the whole court is dressed in mourning. After cremation the bones are placed in golden urns which are kept in the palace and made the object of ceremonies on special occasions.

The Camera Shows Up the White Elephant Illusion in Siam



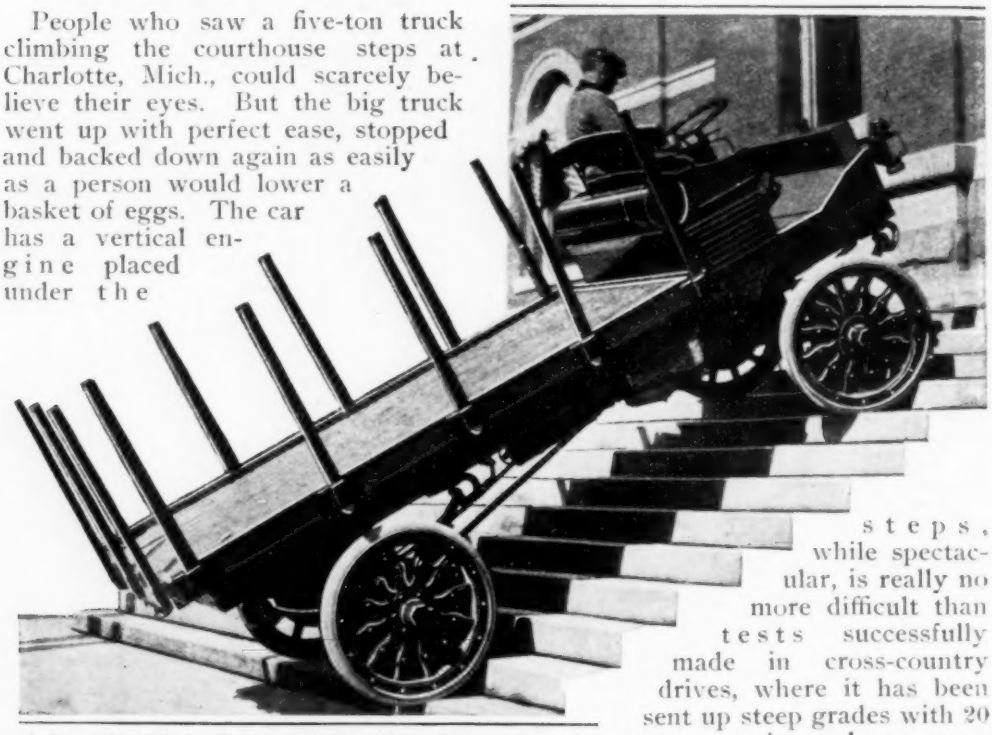
Symbolic Funeral Decorations at a Royal Cremation in Bangkok, Siam. All of These were Burned with the Body

The Eleven-Story Umbrellas are a Sign of the Deceased's Royal Dignity

¶Heat developed in refuse-incinerating plants is being used by many cities to generate steam for waterworks pumping stations.

FOUR-WHEEL-DRIVE TRUCK CLIMBS FLIGHT OF STEPS

People who saw a five-ton truck climbing the courthouse steps at Charlotte, Mich., could scarcely believe their eyes. But the big truck went up with perfect ease, stopped and backed down again as easily as a person would lower a basket of eggs. The car has a vertical engine placed under the seat, and sliding-gear transmission. With 30 hp. and a four-wheel drive the truck appears to be a sturdy traveler, going through sand and mud, up steep grades and carrying its rated load with ease. Its performance on the courthouse steps, while spectacular, is really no more difficult than tests successfully made in cross-country drives, where it has been sent up steep grades with 20 men on it, and up some banks so steep that the men could scarcely hang onto the truck.



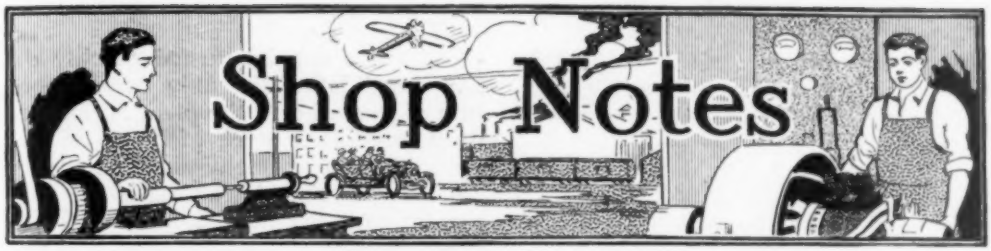
A Four-Wheel-Drive Truck, with One Motor Driving All Four Wheels, Performs Unusual Feat

¶The annual expense of maintaining the best German forests is about $13 an acre, while the gross returns are about $24 an acre.

DEPOSITS OF KIESELGUHR FOUND IN CHILE

The rare earth, kieselguhr, used largely in the manufacture of dynamite, has been found to exist in quantity in Chile. White, friable, fine-grained and porous, it has so low specific gravity that a brick of it floats in water. Under the microscope it is found to be composed of shells of many kinds of diatoms, a microscopic form of marine growth, and is practically pure silicon. Heretofore the world's supply of kieselguhr has come from Germany, Switzerland and Sweden, and the discovery of large deposits in Chile may reduce the cost of dynamite. It is also used in the manufacture of artificial ultramarine, of copper paint, and as polishing powder for steel, gold and other metals. Its porosity and its resistance to acids render it valuable as a nonconducting fireproofing for boilers.

TO CORRESPONDENTS—This is a request to readers of the magazine who write us, to please give their street number. Letters are constantly being returned from the large cities, "undelivered because of insufficient address." A number of our readers buy from newsdealers, hence their street address cannot be found by reference to our mailing list. Those of our readers who have failed to receive the reply to their letters which ordinary courtesy would require, are assured the fault is not with us.

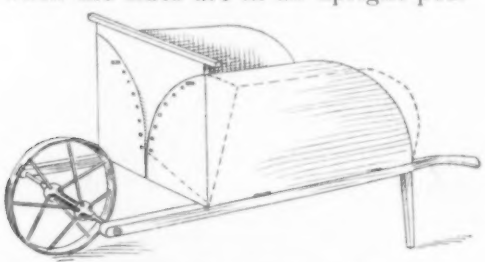


A Pressure Cleaner for Greasy Machinery

Procure an ordinary length of garden hose and adjust the nozzle to a fine stream, then fill it with gasoline or distillate. Attach the hose to a faucet and turn on the water. This will make an excellent pressure cleaner. One hose full of gasoline is usually enough for one engine, but if not sufficient, repeat the filling after running the water out of the hose. As the water pressure is usually high enough in all cities, this method works to perfection.—Contributed by Carl H. Kaufmann, Santa Ana, Cal.

Dump Sides on a Wheelbarrow

The sides of the ordinary wheelbarrow are hinged at the bottom and the ends at the front are fitted with a piece of sheet metal cut on the arc of a circle. Holes are drilled in the sheet iron near the upper edge and corresponding ones in the front end of the wheelbarrow so that they will coincide when the sides are in an upright position. The sides can be set at any angle and a pin inserted in coinciding holes to hold them rigidly.—Contributed by Fred L. King, Islip, N. Y.



Each Side or Both of Them can be Lowered by Removing the Pins

Protection for Building a Brick Stack in Cold Weather

As we were compelled to build a 40-ft. stack in zero weather some means had to be provided to protect the workmen and to keep the mortar from freezing. We built a frame of 2 by 4-in. material and stretched chicken wire over the frame, then two thicknesses of canvas. The structure was built in sections, having four sides and a gable roof, and when the house was completed four men could lift it. A snatch block was provided at the top of the scaffolding at each corner. With two men on the ground and two men at the top the inclosure could be raised with ease when necessary.

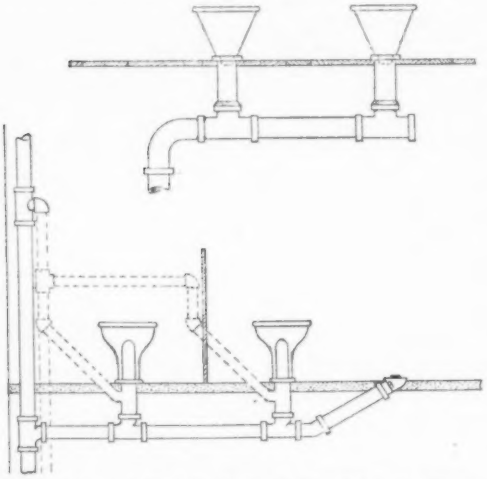
Sections of the Stack were Built Up within the Inclosure Which could be Heated

Sections of the stack were built as high as the inclosure would permit, then it was raised and the staging built up to it. The workmen enjoyed the comforts of a heating stove and electric lights.—Contributed by J. A. Spiker, Pocatello, Idaho.

¶To put a new wick in any lamp burner carefully and quickly, first thread a needle, then run the thread across the wick and pass the needle through the burner.

Old and New Methods in Plumbing

The upper illustration shows the method of plumbing where tile connections and old-style soil basins are

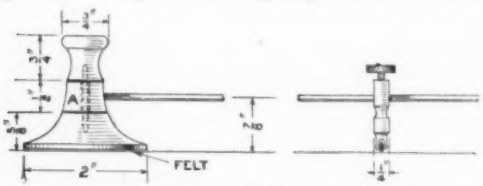


Old Style and New Methods of Plumbing the Same House, Showing How to Make It Sanitary

used without traps. This unsanitary arrangement endangered the health of those living in the house. The other part of the illustration shows how this same house was changed and modern plumbing used. Windows were put in to allow the light to flood the room. The dotted lines show the ventilating pipes which are attached under each soil basin to remove the foul air to the outside.—Contributed by Geo. C. Crowley, Jr., Newark, N. J.

Glass Cutter for Small Circular Work

Without the aid of any special machine the cutting of small circular pieces of glass for gauges and other



An Adjustable Cutter Holder to Make Small Circular Disks of Glass for Gauges

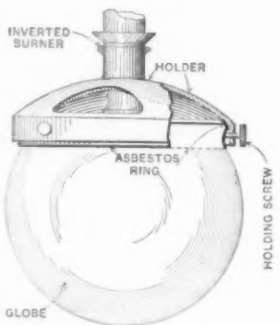
small work is sometimes a difficult and costly piece of work.

The sketch shows a light and inexpensive cutter that can be made with very little expense and labor. The wood parts can be turned quickly on any wood lathe, the only turned portion of metal being the piece A, and almost any other piece of metal in the form of a rod can be used. The arm is No. 10 gauge steel wire, as is also the pin holding the handle knob and the base together.

The cutter wheel, or disk, can be taken from any cheap glass cutter and is easily renewed by punching out the small pin holding it. The general construction of the holder is clearly shown. The radius for a cut is quickly adjusted by sliding the holder the proper distance from the center of the base. In almost any kind of repair shop this little device will be found quite serviceable. — Contributed by F. W. Bently, Milwaukee, Wis.

Protecting Gas Globes

Trouble is often experienced in the use of glassware on gaslights, especially those of the inverted type, due to the expansion of the holder, screws and globe when they become hot. This trouble in most cases can be entirely eliminated by inserting a ring of thin sheet asbestos under the rim of the globe where the screws make a contact. It is desirable to have the ring of such width that no part of the globe holder can come into direct contact with the globe, although this is not so essential as to have the asbestos between the contact screws and the globe.—Contributed by A. P. Connor, Washington, D. C.



¶Turpentine will remove varnish and paint stains from cloth.

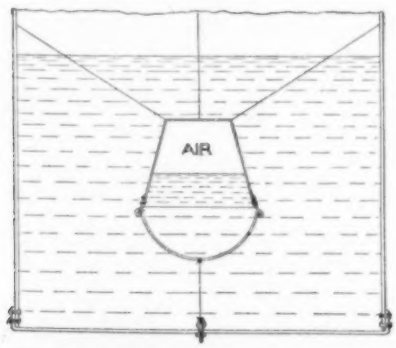
Annealing High-Speed Steel

The most effective way to anneal high-speed steels so that they can be worked in any desired shape like soft machine steel is as follows:

Procure a piece of iron pipe, 5 or 6 in. inside diameter and 12 or 15 in. long, and place the steel inside, then fill the remaining space with cast-iron borings, taking care to have the steel in the center and well surrounded with the borings. This is placed in a forge and heated slowly until the whole is red hot, then, while in the fire, it is covered with ashes and fine coal and allowed to cool.—Contributed by J. W. Hornaday, Birmingham, Ala.

Protecting Tanks from Freezing Water

A great many water tanks are ruined each year by the expansion of the water when freezing in severe weather. A simple device to prevent this is to procure a good-sized copper bucket and suspend it in the water in an inverted position, allowing air to remain in the bucket. When the water freezes the extra pressure that would otherwise be exerted on the walls of the tank, instead acts on the air in the bucket which is compressed, and thus the tank is relieved. An iron or tin bucket would soon rust out in the water and,

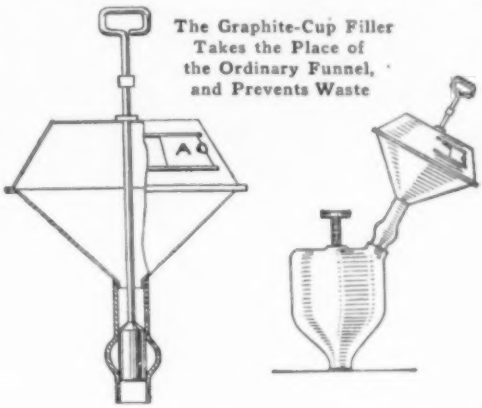


The Air in the Bucket Relieves the Pressure Caused by the Freezing Water

for this reason, it is best to use a copper bucket.—Contributed by Irl R. Hicks, Hallsville, Mo.

Graphite-Cup Filler

Since all modern steam pistons are lubricated with graphite, the graphite-cup filler shown will reduce the waste



The Graphite-Cup Filler Takes the Place of the Ordinary Funnel, and Prevents Waste

caused by spilling or by a gust of wind. The body, or container, is made of sheet metal, attached to a brass casting which constitutes the feeding device. This has a piston, worked by a ¼-in. brass rod with a handle at the top. A piece of ¼-in. tubing is soldered to this rod, above and below the top of the container, at the right distances to prevent the valve from being moved too far up or down. The door A is large enough to receive the graphite easily. It is only necessary to turn the filler into the thread of the graphite cup and work the piston.—Contributed by R. J. Herold, San Francisco, Cal.

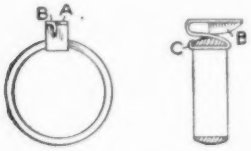
Hardening Crankpins on a Shaft

Desiring to have all the bearings hard on a crankshaft and the throws and couplings soft, I first copperplated the shaft, then turned up the crankpins and hardened them. I found that the pins were well tempered and the other parts soft.—Contributed by Stanley M. Zimmey, Harvey, Ill.

¶When sharpening a pencil stick the knife blade through a slip of paper and it will act as a guard to prevent the lead dust from soiling the fingers.

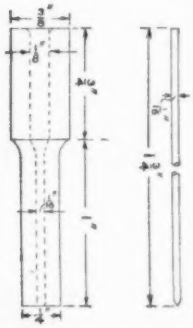
String-Cutting Attachment for a Finger Ring

This attachment can be easily made and will pay for the trouble of making in the time it saves the clerk or wrapper. The knife and holder is cut from a strip of sheet steel, about ¼ in. wide, its length depending on the width of the ring. The steel is cut almost halfway through, as shown at A, then fastened in a vise and bent down and sharpened to form the blade. The other part of the steel is bent as shown and attached to the ring with the end C, or it may be soldered, as desired. The corners and edges should be rounded with a file to prevent chafing the finger.—Contributed by J. V. Loeffler, Evansville, Ind.



Combination Center and Circle Punch

After drawing the desired shape on blanking dies it is usually the custom to drill a series of holes inside of the line as close together as possible and then break out the scrap. In laying out the holes, I found the combination center and circle punch more convenient than the dividers. The drills most used for drilling the holes are ¼ in. in size, and to make the combination for this size, a ⅜-in. drill rod was turned down to ¼ in. on one end, whereupon a $\frac{1}{16}$-in. hole was drilled through its center and enlarged to ⅛ in. at the upper end, as shown. This prevented any interference with the burr caused by constant hammering on the punch.

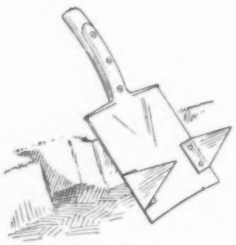


A piece of $\frac{1}{16}$-in. drill rod was placed in a lathe chuck and tapered on the end to the desired angle for the center punch. Then it was cut off so that it was about ¼ in. longer than the circle punch. Both punches were then hardened for about ½ in., on their working ends, and then drawn to a medium-dark straw color.

The circle punch was used to mark off the die, leaving the required distance from the die outline and enough space between each circle to prevent the drill from breaking out into the hole just drilled beside it. After punching the circles into the die blank, the punch is fitted into each circle and the center punch inserted and driven to mark the center of the hole.—Contributed by F. W. Shrier, Pittsfield, Mass.

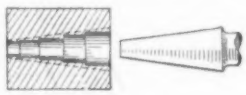
Side Cutters on a Spade

Two sections of an old mower cutter, heated and bent at right angles and riveted on the sides of a spade about 2 in. from the cutting edge, will prove a great help in digging garden and small drains. The spade will make a clean cut, and it is not necessary to jab the sides of the cut to be taken.—Contributed by A. S. Thomas, Amherstburg, Ont.



How to Bore a Taper Hole in Metal

To bore a taper hole in a piece held in a lathe chuck, where neither a taper attachment nor a compound rest is supplied, is a task requiring no little skill. However, the work may be made easier as follows:

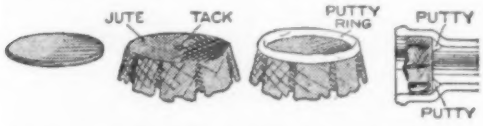


First drill a hole through the metal of a size slightly smaller than the small end of the desired taper, then by successive steps drill larger holes (always a little smaller than the finished size) until the piece takes the appearance shown in the cross section. A plug

should then be turned, having the same end diameter as the hole to be bored and the same degree of taper. By trying it in the drilled hole, the high spots can be easily detected and taken off with a bottoming tool. This is continued until the hole is cut to the desired taper, but a little small and with its surface rough. Finish with a hand scraper, checking and fitting with the aid of red lead or Prussian blue. A very accurate job can be done in this way. A boring tool with a long, straight cutting edge is good to use in place of the hand tool, but it must be used with care and only a short length taken at a time.

Plugging the Bell End of a Soil Pipe

As it was necessary to stop up the open end of a section of soil pipe through which water flowed at intervals, I plugged the end as follows: In

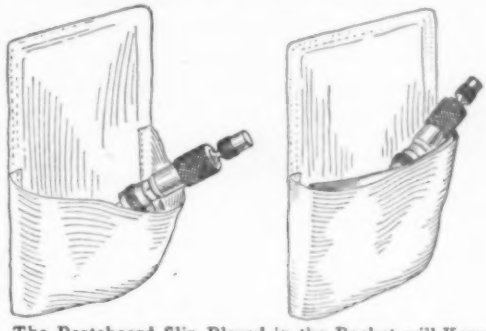


Series of Operations in Making the Parts to Plug the End of a Soil Pipe

the absence of a thick block of wood, I cut a disk out of a piece of white pine, ½ in. thick, smeared the face of it with thick paint and secured a piece of jute on the painted surface with a tack. A ring of putty was placed around the edge—on the jute which held better than the wood—the latter being driven into the pipe. The putty was forced into the shape shown, and made a water-tight joint. A cement plug could be easily built over the wood.—Contributed by J. M. Kane, Doylestown, Pa.

To Prevent a Machinist's Pocket from Sagging

It is customary to place a small hanging pocket in machinists' aprons and shop coats in which to carry a micrometer, or other small tools. It is almost impossible to accidentally spill anything out of the pocket, but most tools carried therein will hang out and away from the body, as shown in the first sketch, where it is liable to



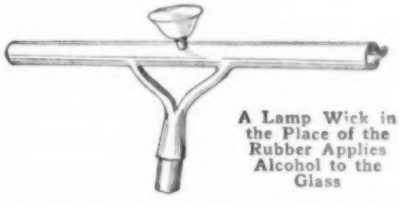
The Pasteboard Slip Placed in the Pocket will Keep It Straight and Prevent Sagging

be struck by a running lathe chuck or other moving part of a machine.

If a piece of pasteboard, the width and depth of the pocket, is placed within, as shown in the second sketch, the pocket will keep its shape and any tool will lie flat against the body where it cannot be broken.—Contributed by Henry J. Marion, Pontiac, Michigan.

Preventing Frost on Show Windows

Procure an ordinary window squeegee, drive out the wood block and rubber and substitute a wick made of a No. 1 burner lamp wick. The wick is rolled lengthwise and inserted in the holder in a position the reverse of that occupied by the rubber. Drill a hole in the top part and center of the squeegee, fit the spout of a small oilcan in it and solder the joint tightly. Fill the can with alcohol and apply the wick to the inside of the window. The squeegee can be used in the hand, or on

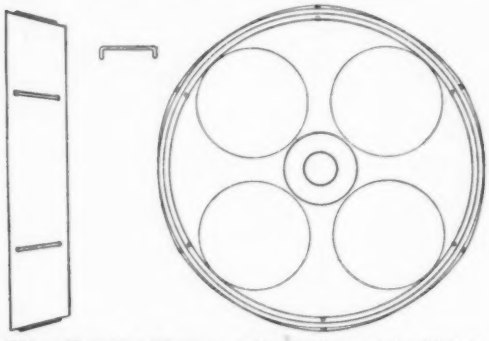


A Lamp Wick in the Place of the Rubber Applies Alcohol to the Glass

a pole for large windows. This application will prevent frost from forming on show windows.—Contributed by C. L. Herbert, Chicago, Ill.

To Remedy the Grip of an Automobile Clutch

The leather clutch on an automobile often grabs very suddenly, sometimes to the extent of doing damage to the transmission and differential. I



Wires Forming Humps on the Surface of the Clutch to Make It Take Hold Gradually

remedied this trouble on my automobile by dividing the clutch frame into six parts—the number of parts, however, is optional—and ½ in. from each side of the clutch, on the dividing lines, I drilled $\frac{3}{16}$-in. holes, then I cut six pieces of $\frac{3}{16}$-in. wire, long enough for the face of the clutch and to pass through the holes. These wires were riveted on the reverse side of the clutch face. After putting the six wires into position I replaced the leather. This caused a hump where each wire was located, so that when the clutch was let in, it would take hold gradually without jerking. This device has been in use on my automobile for a year with entire satisfaction.—Contributed by K. G. Rummelhoff, North Yakima, Washington.

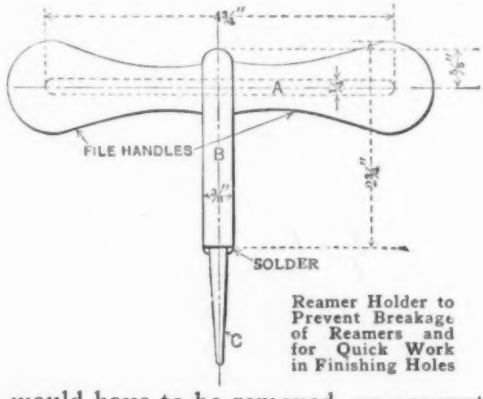
Substitute for Brass Castings

Purchase ½ pt. of muriatic acid and make a saturated solution of zinc chloride. The manner of preparing this solution is to drop particles of zinc into the acid from time to time until no more zinc will be taken up in the solution. Do not inhale the fumes from the acid while it is working. Procure a quantity of brass filings—not spelter—and cleanse them thoroughly in the solution. Melt 8 parts of lead and 2 parts of solder together and, while molten, stir the brass filings in until the mass appears to be all brass; the more brass filings the better. The proportions should be about 8 parts filings to 1 part of the lead and solder.

This metal is especially adapted to work of inventors and can be used in making name plates, brackets, and kindred articles. For molds, either use sand or plaster of paris. If plenty of filings are added to the melted lead it will be hard to detect the finished casting from brass.—Contributed by J. B. Murphy, Plainfield, N. J.

A Reamer Holder

Having occasion to ream 40 taper holes daily for several months on a special job, a great number of reamers were broken in the common tap wrench. To reduce the breakage I made a holder, as shown, from two pieces of cold-rolled steel and two file handles. After cutting the pieces to the right length they were rounded on the ends, as shown, and the body B drilled, to take the reamer C and the crossbar A. The crossbar was then driven into the hole and the reamer shank soldered in place. The file handles were drilled and driven on the crossbar ends. One reamer would finish from 100 to 800 holes, and in all cases



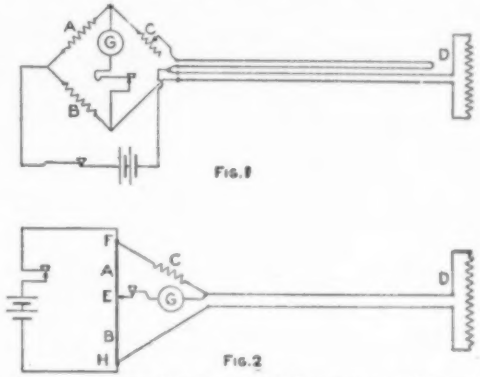
Reamer Holder to Prevent Breakage of Reamers and for Quick Work in Finishing Holes

would have to be removed, on account of being worn out, and replaced with a new one.—Contributed by Andrew Smith, Cleveland, Ohio.

A Simple Resistance Thermometer

It is a well-known fact that the majority of metals undergo a change in the resistance they offer to the passage of a current of electricity through them when their temperature is changed. This change in resistance is almost directly proportional to the change in temperature; that is, if the resistance of a certain coil of wire increases 1 ohm due to a rise in its temperature of, say, 1 deg., its resistance will increases 5 ohms due to a rise in temperature of 5 deg., and so on. Hence a coil of wire and some device for noting the change in the resistance of the coil, due to a change in its temperature, are all that is required in constructing a resistance thermometer. The best practical method of measuring the change in resistance of the coil is some form of the Wheatstone bridge. This bridge, to give reliable results, should be constructed of materials that do not change in resistance with a change in temperature, or proper correcting factors should be used. The thermometer coil itself may be made of a material having such initial resistance that a change in temperature of 1 deg. will result in a change in resistance of 1 ohm. That is, if a coil be made from copper, which has a temperature coefficient of approximately .0042, and it measures 238.1 ohms at zero centigrade, the resistance will increase 1 ohm for each degree rise in temperature. If the bridge indicates the resistance of the coil to be 275.1 ohms, then its temperature is 37 deg. centigrade.

Often it is desired to locate the thermometer coil at some point quite a distance from the bridge, or it may be located in some inaccessible place, such as a grain elevator, or the like, and in such cases the resistance of the leads connecting the coil with the bridge must be taken into account. A simple method of eliminating any errors due to the above cause is depicted in Fig. 1, which shows a simple Wheatstone bridge connected for measuring the resistance of the thermometer coil. The two resistances, A and B, are the ratio arms of the bridge, and the resistance C is the rheostat, or adjustable resistance. The resistance of the leads to the thermometer coil D is offset by introducing two leads, of exactly the same material and placed adjacent to those to the thermometer coil, in series with the rheostat of the bridge. The changes in the resistance of these two sets of leads due to any changes in temperature they may experience will always neutralize each other, and the only resistance indicated by the bridge is that of the coil D. The value of the resistance in the rheostat is equal to the resistance of D when a balance is obtained and the ratio coils A and B are equal in resistance.



Simple Diagrams Showing the Wheatstone Bridge and the Slide-Wire Bridge, the Principle Used on the Thermometer

If a resistance thermometer be constructed along the lines indicated above, its satisfactory operation will depend in a great measure upon a good Wheatstone bridge, the cost of which will be rather high if purchased ready-made, and if constructed, it will involve numerous difficulties, especially its calibration and adjustment. The following description of a simple resistance thermometer eliminates the necessity of a commercial bridge, a form of slide wire being used, as its construction is comparatively simple and the results obtained with its use are quite accurate. The electrical

scheme of the bridge is shown in Fig. 2. The thermometer coil is represented by D; the rheostat of the bridge, by C, and the ratio arms, by A and B, respectively, just as in Fig. 1. In operating the bridge shown in Fig. 2, the value of the resistance of the rheostat is maintained constant, and a balance is obtained by varying the relation between the two ratio arms, which is accomplished by moving a sliding contact, E, along the wire. The ratio arms themselves are composed of a piece of resistance wire of uniform cross section, stretched between the points F and H, as shown in Fig. 2. The connections of the galvanometer G and battery, in Fig. 2, with respect to the arms of the bridge, are just the reverse of their connections in Fig. 1, but the results are independent of these connections; that is, the galvanometer and battery can be interchanged without disturbing the operation of the bridge. In order to increase the sensitiveness of the bridge a long slide wire will be required, but it will only be necessary to use a small portion of it, about 3 ft. near the center, in measuring temperatures ranging from 20 deg. below to 100 deg. above zero centigrade. The portion of the slide wire that is not in use may be formed into two neat coils and the length of the mounting board required will be greatly decreased.

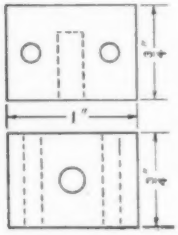


FIG. 3

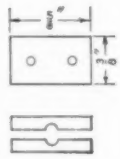


FIG. 4

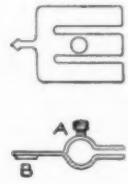


FIG. 5

Supports for the Guide Rod, Clamp for the Slide Wire and the Sliding-Contact Piece

In using the slide-wire type of bridge, the change in the resistance of the leads to the thermometer coil due to a change in temperature cannot be compensated for by introducing similar leads in series with the rheostat of the bridge. The error caused hereby can be overcome, or rather reduced to a minimum, by making the leads from wire having a very low or negligible temperature coefficient.

To construct the slide-wire bridge to use with the thermometer coil, proceed as follows: Obtain a piece of ⅞-in. hardwood board, preferably maple, 4 in. wide and 4 ft. long. Smooth this board down, round off the corners and the edges on one side and give it several coats of shellac. Cut from some well-seasoned maple two pieces having the dimensions shown in Fig. 3. Drill two ⅛-in. holes in each of these pieces, and a ¼-in. hole a little over halfway through, as indicated in the sketch. Obtain a piece of ¼-in. steel rod, 3¼ ft. long, and mount it upon the base with these pieces, as shown in Fig. 6. The upper end of the rod should be about 2½ in. from the upper end of the board upon which it is mounted, and about ¾ in. to the right of the center of the board. Make two clamps, to be used in mounting the slide wire, from some thin sheet brass, similar to that shown in Fig. 4. These clamps should be mounted on the base alongside the supports for the rod. Cut out a piece similar to that shown in the upper part of Fig. 5, from some thin sheet brass, and bend it into the form shown in the lower part of the same sketch. Solder a small metal handle, A, to this piece

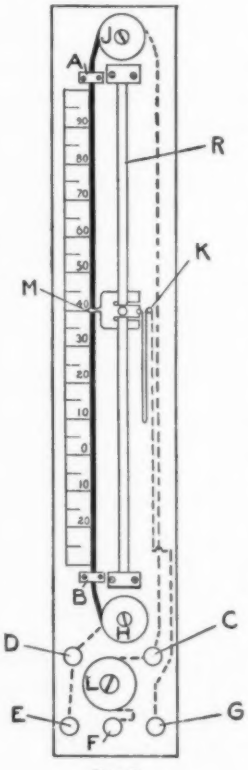


FIG. 6

and also a contact piece, B, as indicated. The lower edge of the contact piece should be fairly sharp so that it will make contact with a definite point on the slide wire.

Procure 30 ft. of No. 22 gauge cotton-insulated "Advance" resistance wire. Fasten this wire in the two clamps, A and B, Fig. 6, so that its center is about 8 in. above the lower clamp. Carefully remove the insulation from the wire between the clamps and mount directly under it a piece of heavy cardboard upon which the scale is to be marked. Mount five small back-connected binding posts on the lower end of the base, as indicated in Fig. 6, by C, D, E, F, and G. Wind the lower portion of the slide wire on a small wood spool, H, and solder the end to the binding post D. The upper portion of the slide wire should be wound on the spool J, and its end connected to the binding post C. Connect binding posts D and E, as indicated. A connection should be made from binding post G to the sliding contact, the portion shown by the full line being a flexible conductor, passed through the hole K. All connections shown by dotted lines should be made in grooves cut in the under side of the board forming the base. Provide a third wooden spool, L, upon which to wind the wire forming the rheostat of the bridge.

The thermometer coil should be made by winding about 250 ft. of No. 40 gauge cotton-insulated copper wire very loosely upon an open wooden core or rectangle of thin mica. The coil should be well protected from mechanical injury, but the protection should not interfere with the free circulation of air about the winding. The leads to this coil should be made from "Advance," or some other wire having a low temperature coefficient. Solder the coil and leads together and fasten the free ends of the leads under the binding posts E and F. Connect a battery of several cells through a contact key to the binding posts C and D, and a galvanometer, or telephone receiver, to the binding posts F and G. Now wind on the spool L a sufficient amount of No. 30 gauge cotton-insulated "Advance" resistance wire so that the bridge balances with the contact M about 8 in. from the lower clamp when the temperature of the thermometer coil is zero centigrade. After this adjustment has been made the remainder of the scale may be marked by noting the positions of the contact M for various temperatures of the thermometer coil, which can be determined by means of a good mercury thermometer. Give the thermometer coil ample time to reach a constant temperature before marking the scale, as the accuracy of the instrument will depend in a great measure upon this calibration.

Snowplow for Clearing Sidewalks

The illustration shows a V-shaped plow made of boards and attached to the shank of an ordinary garden plow after removing the shovel. Each board is 10 in. wide and 2 ft. long. The rear ends are 2 ft. apart, braced with a crosspiece, fastened securely as shown.

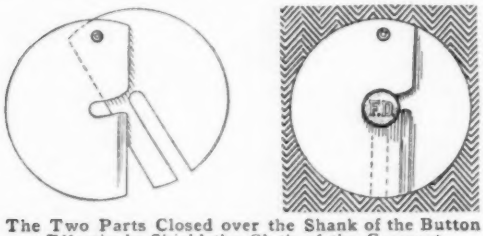
The Shovel is Attached to the Shank of a Garden Plow and Used as When Plowing Soil

This plow surpasses a snow shovel many times for ease and speed.—Contributed by Dr. J. S. Burnett, Plymouth, Ohio.

¶Soya-bean oil, used as a paint oil, stands about midway between linseed and corn oil. It is fairly durable, but does not dry in very well.

Shield for Cleaning Buttons on Garments

Firemen, policemen, porters, or other persons wearing uniforms must remove the buttons from time to time and clean them. To save time and

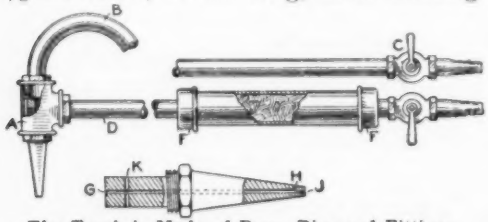


The Two Parts Closed over the Shank of the Button Effectively Shield the Cloth of the Garment

trouble, one fireman made a shield to protect the cloth and hold the button while cleaning it, without removing it from the garment. The shield consists of two pieces of sheet metal, tin, aluminum, brass, or copper, cut in half-circular disks and hinged on one side, as shown, with a slot cut in each piece in different directions so that, when the shield is slipped over the button and closed, the latter is held firmly for polishing.—Contributed by Charles A. Kauffman, Pittsburgh, Pa.

An Oxyacetylene-Welding Torch

A very simple torch for use with an oxyacetylene-welding outfit can be made as follows: Procure a brass tee, A, about ¾ in. in size, and bush one of the openings and the side outlet down to ⅛ in. The upper pipe B is ⅛-in. brass, 16 in. long, after making



The Torch is Made of Brass Pipe and Fittings, Only the Nozzle Requiring Special Work

the gooseneck bend in it, as shown. The bent end is turned into the bushing of the tee and a gas cock, C, is attached to the opposite end.

Another piece of ⅛-in. brass pipe, D, 10 in. long, is turned into the side-outlet bushing. The end of this pipe is supplied with a filtering drum, which is made of ¾-in. brass pipe, about 4 in. long, with caps, FF, on the ends, the caps being drilled and tapped to receive the ⅛-in. pipe. The drum is filled with mineral wool, and a gas cock is fitted to the end as in the upper pipe.

The tip, or nozzle, is made of brass or copper with a $\frac{1}{16}$-in. hole drilled from G to H, as shown, and a very fine needle hole from H to J. Two $\frac{1}{16}$-in. holes are drilled through the nozzle, at K, at right angles and crossing the hole GH, thus making four inlets to the center hole. Thread the outside to fit the ¾-in. tee. The end, having the crossed holes, should be just long enough to seat against the upper bushing and of sufficient diameter to permit this seating and yet provide a space between it and the body of the tee A. The assembled parts appear as shown.

The oxygen is admitted through the pipe B, and this gas, having the higher pressure, helps to draw in the acetylene which is admitted through the pipe D at a lower pressure. The two are mixed in the tip and are forced out through the nozzle, where they are burned at a high temperature.

If care is taken to have the nozzle seat against the upper bushing tightly, so that no oxygen can escape except through the needle hole J, the torch will work as well as any made. The oxygen pressure should be from two to three times the acetylene pressure. The oxygen at 25 lb. and the acetylene at 10 makes a good, average working pressure.

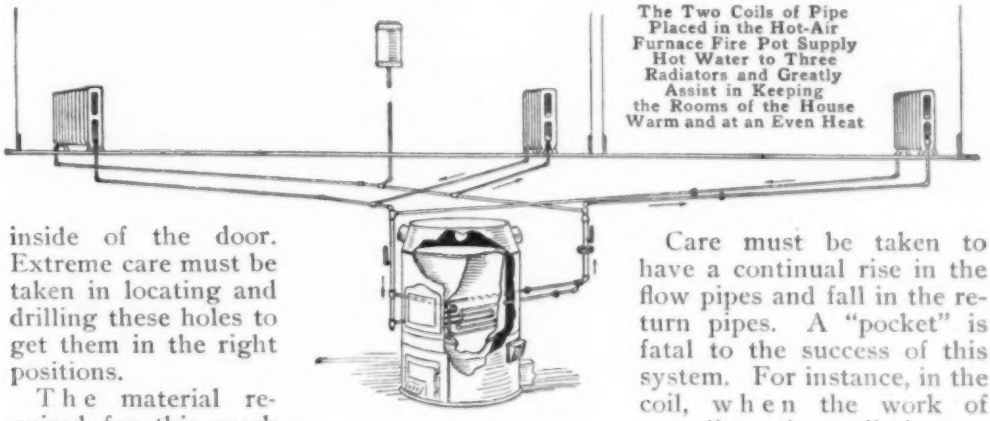
To light the torch, turn on the acetylene, light it and keep turning the gas on until it burns steadily, then gradually turn on the oxygen until the flame becomes a clear white and cone-shaped, in the center of a blue flame. At this point it is ready for use.—Contributed by A. H. Waychoff, Lyons, Colo.

¶Use a solution of chloride of lime to remove fruit or grass stains from cloth.

Water-Heating Attachment for a Hot-Air Furnace

By J. A. McCRACKEN

As a means of utilizing the waste heat in a hot-air furnace I installed a pair of coils which supplied sufficient heat for three radiators with a radiating surface of 150 sq. ft. All three radiators were on the first floor, in the dining room, parlor, and reception hall. The expansion tank, which holds about 10 gal., was placed on the topmost shelf of the pantry. Two ¾-in. holes were drilled in the furnace jacket, after removing the outer casing, directly in the rear, and two ¾-in. holes in the frame of the fire door, just high enough from the bottom to let the fitted coil rest on the radiator shelf inside of the door. Extreme care must be taken in locating and drilling these holes to get them in the right positions.



The Two Coils of Pipe Placed in the Hot-Air Furnace Fire Pot Supply Hot Water to Three Radiators and Greatly Assist in Keeping the Rooms of the House Warm and at an Even Heat

The material required for this work is a coil of ¾-in. iron pipe—galvanized preferred—consisting of five turns, each a little shorter than the other, as it is built up toward the top and arranged so that the coil may be crowded on its side into a small space. In the instance referred to the fire pot of the furnace was 20 in. in diameter, and the length of the turns averaged 15 in. The last turn, which was uppermost, extends through the hole, on its side, in the back of the furnace. At this point unions were put in and, by means of a reducing tee, the hot-water leads run into a 2-in. main having a flange union which carries it to the level of the top of the furnace. Here it branches into two 12-ft. lengths of pipe, one 1 in. in diameter, for one radiator, and the other, 1½ in. in diameter. The latter branches into two 1-in. pipes to the two other radiators.

The return pipes, carrying the cold water, are 1 in. in diameter until they meet, above and in front of the furnace, where the main is 1½ in. in diameter. This main branches just above the fire door, and a ¾-in. pipe is run across and down on the right to enter the door frame through the right-hand hole for the coil on that side. The expansion tank is connected by a 1-in. pipe to one of the hot-water pipes.

Care must be taken to have a continual rise in the flow pipes and fall in the return pipes. A "pocket" is fatal to the success of this system. For instance, in the coil, when the work of crowding the coil into a smaller space is being done, it is easy to let one length run down a trifle, then up. This would make a pocket. All threads, especially for the coil, must be well coated with white lead before turning them together. The bends, where the pipes turn from the almost horizontal to the vertical for connection with the radiators, cannot be exact, as some lateral extensions may be made, in some cases more than in others. The diagram is not intended to illustrate this point. To make such a connection where one pipe rises slightly and the other is vertical, use a street elbow and a common elbow. Wherever possible, a 45-deg. turn should be given to save loss of move-

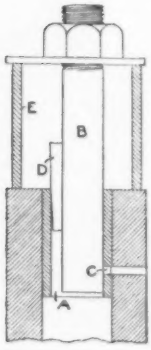
ment by friction. Thermometers are placed on the hot-water main and on the cold-water main. If the water is heated above 200 deg. it is liable to back up in the returns.

When the pipes are installed in the furnace, the space between the pipe and the wall of the drilled hole should be carefully plastered full with asbestos dough. The open space in the casing wall should be sealed with a metal sheet, asbestos cloth, and dough.

The coils will not disturb the working of the hot-air furnace and a great increase in the amount of heat will be supplied by means of the hot water.

Removing Tight Bushings

Quite frequently a worn bushing, A, or roller-bearing lining, must be taken out of a housing on the frame into which it has been pressed. In many cases it is impossible to get at the back end of the bushing to drive it out. For this special work a tool can be made as follows:



A piece of steel, B, is threaded on one end for several inches, and a nut supplied that will turn freely on the thread. Into the side of the piece near the other end is driven a ⅜-in. pin, C, which is filed down so as to be not over ¼ in. long. Where no oil hole is available, it is necessary to drill one through the housing and bushing. The puller is inserted with the pin entering the drilled hole. Naturally it is smaller than the hole in the bushing, so it must be blocked or wedged, as at D, on the opposite side, to hold the pin in place. A piece of pipe, or other piece of metal of similar shape, is procured and set over the end of the housing and a large washer placed on top, whereupon the nut is screwed on the threads. When turned with a wrench, the nut will usually remove any bushing, no matter how tight it is. The weak point is the small pin and, if it fails, a larger one may be tried, though, in average work, the cases are few and far between where a ⅜-in. pin will be sheared off.

Escape from a Locked Safe Trick

The mystifying trick of locking the performer in a steel safe and then having him come out of it without aid is very simple, although but few, even the safe owners, know how it is accomplished. All that is necessary for the performer is to provide himself with a small electric flash lamp, a good screwdriver, a bicycle wrench, and a small can of oil for emergencies. There is a small plate on the inside of the door which covers the lock and is held with screws. This is removed and the tumblers turned so that the bolt can be withdrawn. When out of the safe it is an easy matter to replace the plate quickly. Of course a covering of cloth is lowered over the safe during the time of unlocking the safe and coming out of it.

Recessing the Bottom of a Drilled Hole

An ordinary boring tool used to recess the bottom of a drilled hole will spring when the feed is applied. The tool as illustrated was devised to prevent the spring as the cut is taken. It is made of a piece of steel the size of the hole to be recessed. A small hole is drilled through the piece lengthwise and a little out of center. The distance the hole is to be drilled out of center will depend on the size of the tool. The cutter is made of a piece of tool steel that will fit the hole, the end being

The Revolving Cutter will Easily Make the Recess without Springing Away from the Work

turned and a cutting edge ground on it.

The projection A butts against the bottom of the drilled hole and prevents the tool from touching the end of the hole. The cutting tool may be

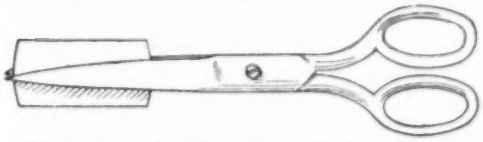
turned by hand or in a drill press, and when the recess is cut the tool is turned in and the holder removed.—Contributed by A. Whittle, Quebec, Canada.

Exercising Poultry in Winter

An ingenious farmer installed a windmill on his poultry house as a means of giving the fowls exercise during cold weather when they could not get out. The windmill is connected to a large wheel with a shaft, the wheel being hung about 3 ft. from the floor. Cabbage and other vegetables are hung on the wheel. The windmill turns the wheel and the poultry chase around after the food.—Contributed by Herbert S. Spencer, Whitney Point, N. Y.

Stropping Handle for Safety-Razor Blades

Insert a safety-razor blade in an ordinary pair of scissors and use them as a handle in stropping in the same

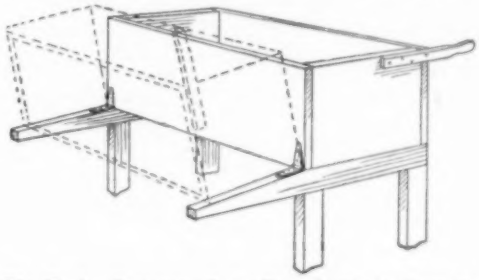


The Blades of the Scissors will Hold the Wafer Razor Blade Securely for Stropping

manner as the ordinary razor. If the points of the scissor blades are too open to grip the wafer blade and hold it securely, insert a thick piece of paper with the blade.—Contributed by H. C. Hunt, Potterville, Mich.

A Hinged Watering Trough

As the usual method of draining a watering trough for horses by means of a plug or valve was unsatisfactory on account of the freezing up of the parts, I set out to devise some other means and the result was the hinged construction shown in the sketch. For this purpose the trough was mounted on crosspieces in the usual manner and hinges were placed at one side so that the trough could be tipped upon its side to drain. A small handle may be



The Entire Contents of the Trough can be Dumped at Once and Left to Drain

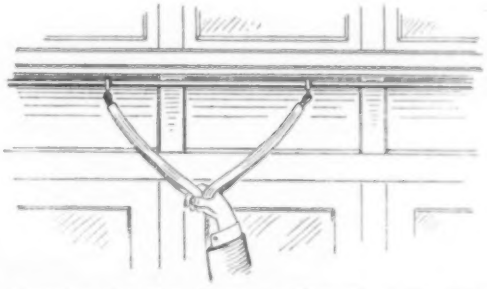
nailed at the end of the trough to make the tipping easier.—Contributed by Thos. L. Parker, Wibaux, Mont.

Drying Rack for Seed Corn

Procure a barrel or a short log and drive nails into it, allowing their ends to project and spacing them about 3 in. apart. Push the large end of the cob on a nail. Several hundred ears may be kept on one barrel.—Contributed by R. H. Workman, Loudenville, O.

Stabilizing the Strap Hanger

One day as I was clinging to a street-car strap on my way to work I was struck with the idea of an easy way to keep my balance when the car started and stopped. Nobody used the strap next to the one I was holding, so I grasped the two in one hand as

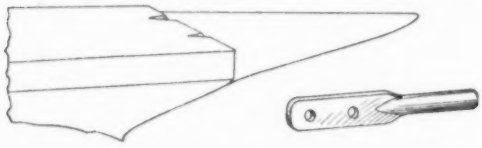


Grasping the Two Straps in One Hand Prevents the Holder from being Jerked in Either Direction

shown, and this made a stable support whether the car stopped or started.—Contributed by F. F. Ravlin, Chicago.

Forging Notch in an Anvil

A V-shaped notch filed or ground in an anvil, as shown, makes a depression or die to form braces while forging



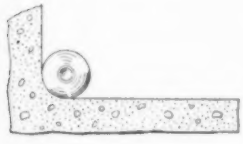
A Die is Formed in the Anvil Face for Forging a Brace on Flattened Rod Ends

flattened ends on rods. This not only makes a neat end, but strengthens the part where it is usually weakest.

The notch can be readily cut or filed on many anvils, but those having hard faces will require grinding.—Contributed by D. C. Goff, Knoxville, Tennessee.

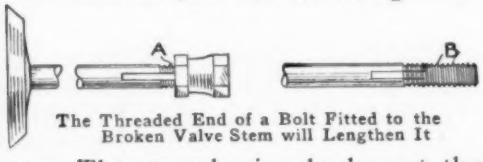
Concrete Form to Make Round Inside Corners

To avoid sharp angles where a concrete floor joins a wall, it is best to make a slightly round corner. A bottle of the desired radius makes a good form for this work, as the cement will not stick to the glass and the surface of the concrete will be left smooth.—Contributed by N. M. Baldwin, New London, Conn.



Repairing a Broken Valve Stem

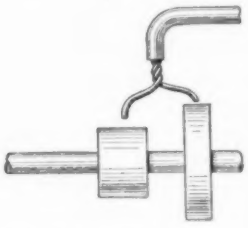
On the road and far from a repair or supply shop, a valve stem in my motor broke and I fixed it on the spot, so that it is still working as well as a new one, in the following manner: The stem having broken at the point A, I procured a ⅜-in. bolt, sawed the threaded end B off at the right length and then filed it on one end to fit the slot in the stem. Three standard nuts were then run on to hold the parts solidly. The slot was shortened somewhat, and it was necessary to make a new key of soft steel, as the original one was casehardened and could not be filed down.—Contributed by A. B. Conkwright, New York.



The Threaded End of a Bolt Fitted to the Broken Valve Stem will Lengthen It

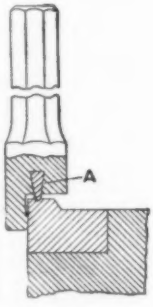
Oil Feed for Milling Cutters

A milling machine having but one spout for feeding oil to cutters does not fulfill the requirements where two or more cutters are used at the same time. The illustration shows one of the most satisfactory methods of flowing oil to one or more cutters. Two pieces of soft wire—wire solder will do—about ⅛ in. in diameter, are twisted together as shown, and the twist inserted into the oilcan spout. The oil will follow the wires and drop on the cutters.—Contributed by Joseph J. Kolar, Maywood, Ill.



Upsetting Tool for Punches

The body of the tool is forged of tool steel as shown in the sketch. The hardened piece A is secured in a dovetailed groove. The tool is used in the manner shown without danger of burring the edge by a misplaced blow of the hammer.



¶The greater the difference in temperature between two bodies, the more rapid will be the transfer of heat, so the hotter the fire the more quickly is steam generated in the boiler.

Increasing the Diameter of a Worn Crankpin

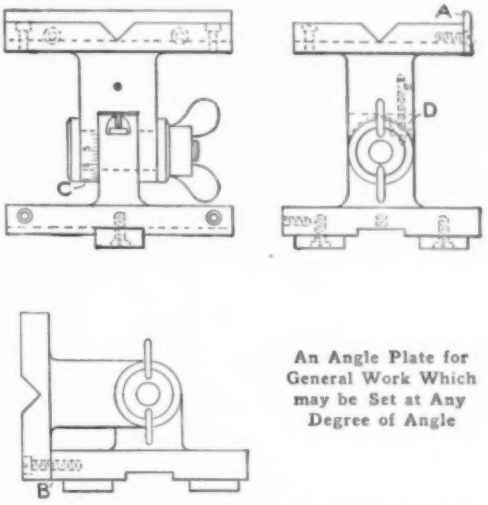
A crankpin was found to be considerably out of true, and to turn it up would necessitate the making of a new connecting rod and brass, so it was decided to build the piece up to fit the brasses in the old connecting rod. This was accomplished as follows: The crankpin was centered, as accurately as possible, in a lathe and a rounded-end threading tool used to cut a groove spirally on the surface of the pin. The groove was not cut deep and the feed was set for a large thread so that about $\frac{1}{32}$ in. was left between turns.

One end of a piece of steel wire was then brazed to the pin and tightly wound around it in the spiral groove. The wire was of such size that it filled the groove and fitted snugly against the preceding turn. When the whole pin had been wound, the wire was brazed and the pin was then turned in a lathe to the proper diameter. When completed the surface of the pin was perfectly smooth and it was almost impossible to detect that it had been wound with wire.—Contributed by John Downes, New Bedford, Mass.

A Toolmaker's Angle Plate

The angle plate shown in the sketch was designed as an adjunct to the toolmaker's bench plate. It also may be used on many kinds of small work that must be machined or ground. Just a little study of the construction will convince any toolmaker that it can be used for a large range of general work, such as laying out, testing angles, etc., surface grinding, boring holes in jigs and dies at an angle. It is provided with slot blocks for use on the milling machine or shaper.

The two V-notches, milled, crossing the face of the swinging plate, still further increase its scope of usefulness. The hardened and ground strip A can be used to good advantage when it is necessary to mill or grind a number of pieces alike. A few $\frac{3}{16}$-in. holes can be tapped in the plate and some clamps made with which to fasten the work. The edge of the base B should be ground off square to the proper dimension so that, when the screws are put



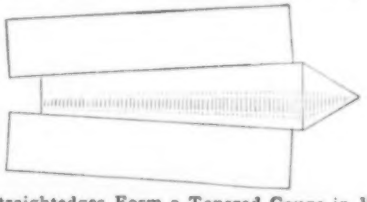
An Angle Plate for General Work Which may be Set at Any Degree of Angle

in as shown, it can be used as an ordinary angle plate. The surface C is hardened, ground, and graduated. The screw D is only to be used when the plate is in a parallel position.

The time required to make the angle plate will be repaid many times over by its use, and if four or five toolmakers are working at a bench one angle plate will be in almost constant use.—Contributed by A. Van Wagner, Newark, N. J.

Taper Gauge

If one wishes to turn a center or taper plug of any kind and there is no hole to fit it in, take the original taper piece and place it on a surface plate,

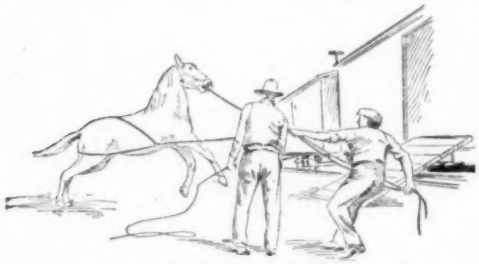


The Straightedges Form a Tapered Gauge in Which the Turned Piece is Tested

and clamp straightedges on the sides as shown in the sketch. This method will give as good results as if there were a hole to fit the plug in.

Loading a Balky Horse in a Freight Car

While loading horses in a car we were troubled by one large animal balking, and although we tried every expedient we could think of, the beast

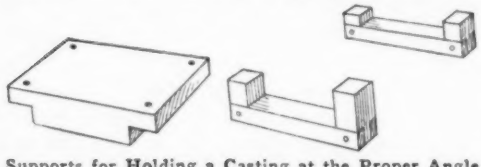


Manner of Inducing a Balky Horse to Enter a Freight Car for Shipment

could not be induced to enter the car. After half an hour of useless work one of the cowboys suggested that we tie a rope around the animal's rump and pull on that as well as on the halter rope. This we did and it worked to perfection, proving a great help in future work of this kind.—Contributed by Harlow D. Burnside, Ekalaka, Montana.

Drilling Slanting Holes in Metal

A quantity of castings, shaped as shown in the sketch, required a hole in each corner to slant at an angle of about 15 deg. to the sides. It is readily seen that a different setting is required for drilling each hole. The tops of the holes slanted inward and imaginary continued center lines would meet at a



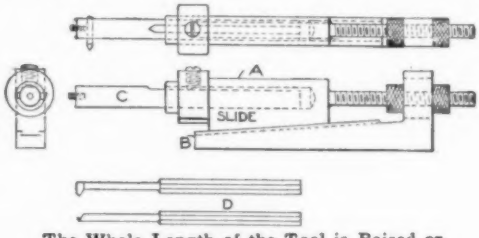
Supports for Holding a Casting at the Proper Angle for Drilling Slanting Holes at Each Corner

point about 8 ft. above the piece. To save the setting for each hole to be drilled, two supports were made as shown with end pieces attached, each one of a different length, which gave the proper slant to the piece for drilling the hole. By shifting the casting all the holes could be drilled at the same slant without any special setting.—Contributed by Donald A. Hampson, Middletown, N. Y.

A Lathe Boring and Threading Tool

A boring and threading tool, suitable for both large and small work, is shown in the sketch. It is the invention of a correspondent of American Machinist, and consists of three main parts, the tool holder, A, the base, B, and the tool, C. The holder and base are attached together with a dovetail slide, which is on an angle with the center line of the tool, making it possible to change the height and at the same time always keep the tool parallel with the hole being bored or threaded.

In the rear end of the base an oblong hole is provided in which the threaded end of the tool holder can slide, and two knurled nuts are fitted



The Whole Length of the Tool is Raised or Lowered on a Parallel with the Hole

on the threads for the adjustment of the height. If used for large holes, the tool can be made as shown, where the smaller tools are inserted in the end of C and kept in place by the setscrew. If the work is to be threaded to the bottom of the hole, or the hole is too small for the tool, the part C may be changed for a forged tool, D, fitted in the hole in A and held to the desired length by the setscrew.

¶Railroad painters use a mixture of one part of muriatic acid to six or seven parts of water, varying the proportions to suit the work in hand, to clean varnished surfaces that have become soiled with grime. Acid such as acetic, or strong vinegar, is also a good cleanser of varnished surfaces.

Practical Telephony

By HAROLD HINTON

PART X—Subway and Underground Cable

The statement has been made in a previous chapter that underground conduit, or subway, and underground cable are considered the most up-to-date and practical method of installing telephone wires. While the cost of building up a plant in this manner is somewhat higher than is the cost of open-wire construction, the saving in maintenance and the doing away with the majority of the smaller cases of "trouble," as well as the removal of practically all the expense attached to obtaining right-of-way for pole lines, are the principal points in its favor. Poles are also unsightly, no matter how they may be painted and fixed up to look like the surrounding scenery, and the mass of overhead wires and lead-covered cables is also dangerous in the extreme.

The maintenance, however, is a considerable item, even when the cables are placed underground, for, when a case of trouble shows up in a cable, it means real trouble, and a good many hands to locate, test out, dry out and splice up the damaged portion. Often it is also necessary, when a cable is wet, to pull in an entire new section and this costs money as well as takes time. Underground cables are damaged principally by water which enters

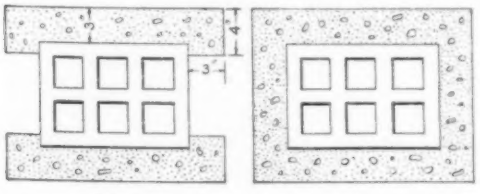


FIG. 70 FIG. 71

A Base and Cap, Also a Complete Jacket Made of Concrete to Protect the Tile Duct

either a sand hole in the lead sleeve; a poorly wiped or broken joint; a small hole in the cable sheath, etc., when the manhole fills up from any cause. Mechanical troubles, such as caused by a pickax entering the sheath and damaging the insulation on the wires; a handax falling into a manhole and cutting the armor, are also liable for a large sum of money annually in the underground plant. Electrolysis, the

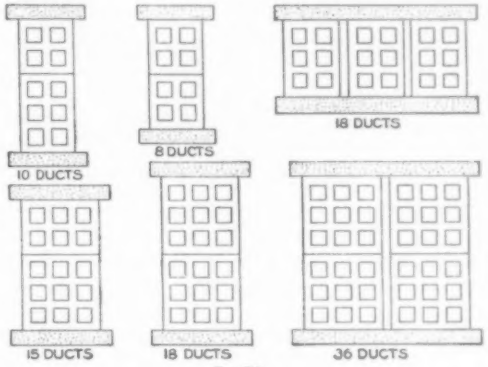


FIG. 72

Various Styles of Tile Ducts Made in Vitrified Clay and Their Arrangement to Meet Conditions

"terror of the underground," is probably the most frequent offender in most cities and towns of this country, but its work can, to a certain extent, be avoided and such expense really should be charged about one-third to electrolysis and two-thirds to carelessness, in not making frequent surveys to ascertain what manholes and cables are being affected by it and immediately rebonding the cables to check its ravages.

In the construction of the subway itself, the units are usually laid on a concrete foundation, or base, which should have a very gentle slope in either direction so that the water which may collect in the ducts will not stay there, but run into one of the manholes. This base keeps the tile even, and a concrete cap, as shown in Fig. 70, is placed on top. In a number of instances, however, where the subway runs in close proximity to some foreign subway, water main, gas main, or other underground construction which is likely to be disturbed at almost any

time for repair or other reason, the tile is laid as shown in Fig. 71, using a full concrete jacket. This not only prevents mechanical damage to the tile,

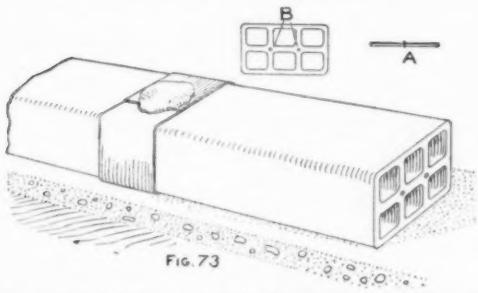


FIG. 73

Multiple-Duct Tiles are Joined Together with Dowel Pins and the Joint Covered with Tar Paper

but also protects it in case the entire tile should be uncovered and undermined, as is often the case. Even if there were no cable in the ducts when they were broken, the earth would naturally enter the ducts and cause a great deal of annoyance and expense when the time came to pull cable through it.

The various styles of ducts used are vitrified-clay tile (multiple-duct tile or "M.D.T."); creosoted wood (pump logs); fiber duct and 3-in. iron pipe. The quantity of these different materials used ranks as they are named.

Vitrified-clay tile comes in 1, 2, 3, 4, 6, and 9-duct units, with which a subway of any number of ducts may be constructed to meet any condition, as shown in Fig. 72. These multiple-duct tiles are laid together, end to end, and lined up with dowel pins, shown at A in Fig. 73, which fit into holes, B, in each unit, and the joints are cov-

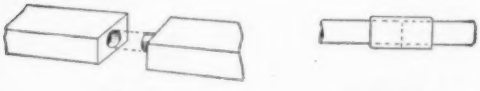


FIG. 74 FIG. 75

Joints Used in Creosoted Wood, and the Slip-Joint Connection for the Fiber Ducts

ered with single-ply tar paper, or burlap, which is fastened securely with a dab of mortar or concrete.

Creosoted-wood ducts offer the simplest and quickest construction, as they are usually laid on the bare ground—in a trench, of course—driven together with a mallet and a wire pulled through, whereupon the joints are lined up and the trench back-filled. Each length has a collar on one end and a socket on the other, as shown in Fig. 74. These wood ducts are usually employed for single-duct runs and, in connection with a pipe bend, for laterals, and are often run on top of the concrete cap of the main conduit so that the tile will not have to be broken to install a pole-end cable, or lateral.

Fiber ducts are, to a certain extent, a poor type of construction unless they are bedded in concrete, and, as they are inclined to soften in the warm summer weather, it is more difficult to place them properly than either wood or tile. These ducts, being made from vegetable fibers, in a large degree, are naturally a good conductor of electrical currents while the clay tile, being really a cheap grade of glass, is an excellent insulator. The wood duct being protected by the creosote, is also a pretty good insulator. The fiber ducts are joined together by means of a slip joint, as shown in Fig. 75.

The distances between subway manholes are termed sections and, because of the large cables which are being pulled through them, the sections should be kept as near to 400 ft. apart as possible. If the ducts have been laid in a snaky fashion, it is customary to put manholes as close together as 60, 40 and even 15 ft. It is best, however, to place just as few as possible to reduce the cost of the subway. Sections of 600 and even 700 ft. have been built, but it is poor practice and should be avoided except in the most extreme cases where there is absolutely no other way, and such instances are rare.

The average depth at which underground subway is laid is about 24 in. to the top of the tile, or concrete cap, from the ground level, but in the congested districts of larger cities they have been placed at a depth of 14 ft. to keep clear of obstructions that

would cause too many breaks in the grade. It is on account of these obstructions that it is advisable, when possible, to open a whole section between manholes before starting to lay tile. Small gas and water-service pipes can often be changed so as to be taken out of the way of the conduit run if necessary. Permanent obstructions which cannot be removed can be dodged as shown in Fig. 76; abrupt changes in grade will not allow the pulling in of the cables. The sketch at the bottom shows what is termed a "split break," meaning that one unit goes over the obstruction and the other unit under it; the middle sketch, how to clear three obstructions which are nearly on the same level, and the top, a very frequent proposition, a large obstruction near one of the manholes.

Manholes are usually constructed of brick and 4 ft. wide, 8 ft. long by 7½ ft. deep, with a headroom of at least 5½ ft., so that a man may work in them without being all doubled up. Concrete manholes were very popular a few years ago, but on account of the concrete getting so hard in the damp earth that little short of a steam drill could get into the walls when the manhole had to be enlarged or remodeled, it was given up in favor of brick. The bottom of the lower duct of the subway should be about in the middle of the wall.

Underground Cables

Before pulling the cables into the newly finished subway the ducts must be "rodded." The rods come in 3-ft. lengths, so as to be readily handled in the manholes, with some kind of a screw or lock joint which will permit their rapid and handy placing together and separation without danger of coming apart in the ducts. The principal rod connectors in use are called "cope" rods and "screw" rods. A rod is pushed into the duct; a second rod is attached to the first and pushed in; a third to the second, and so on, until the first appears at the other end of the section. A pulling rope of flexible steel cable, or a No. 12 gauge galvanized-iron wire, is attached to the last rod and pulled through to the next manhole, the men in the latter hole uncoupling the rods as they pull in the cable or wire. If the wire is pulled in

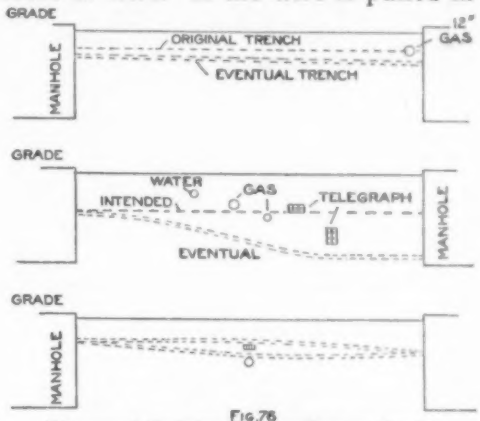


FIG. 76
Manner of Dodging Obstructions to Avoid Abrupt Changes in the Grade

by the rods, the pulling rope must be attached to it and pulled through the ducts. A turn or two is then taken around a winch, capstan or power drum and a wooden mandrel, which is only about ¼ in. smaller than the ducts and provided with a sole-leather washer that fits the ducts tightly, is then pulled in to clean out the dirt, concrete, and other coarse, hard substances which might injure the cable sheath. To the rear end of the mandrel another pulling rope is attached, and to this rope the cable is fastened by means of a cable grip, or a clevis. The cable reel is set up at the manhole, as shown in Fig. 77, and the cable is

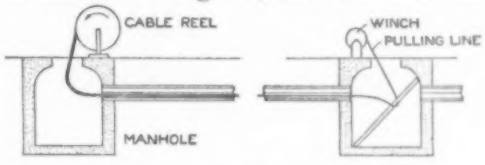


FIG. 77
Showing How a Reel is Set Up at a Manhole for Pulling in Cables

easily pulled in by the capstan. The holes in the end of the cable, if a clevis is used, are then soldered closed, so that the cable will not absorb any moisture.

The cable splicers now start to con-

nect the sections into a cable. The first thing the splicer does is to test out the sections for opens, grounds, and crosses. This is a simple test and,

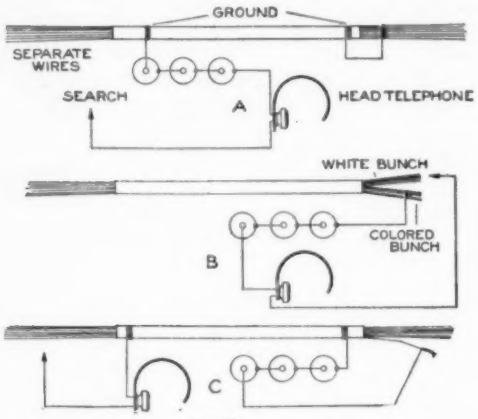


FIG. 78
Connections for Testing Out Cable Lines for Opens, Grounds and Crosses

unless the factory neglected to mark the bad pairs or wires, it should not take much over an hour and a quarter to a section. The test is made as follows: The sheath is removed from both ends of the section, or cable, for a distance of about 6 or 7 in. and the insulation removed from the wires for a distance of about 3 in. The section is now ready for the ground test. The bare wires at one end of the section are bunched together and grounded, or connected to the cable sheath, leaving out any wire which is marked bad when the armor is removed, and the wires are tested in a bunch against the cable sheath, using a head phone and

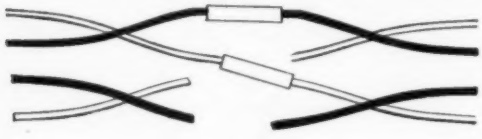


FIG. 79
A Split Pair is Where Two Whites are Joined and Two Colored of Different Pairs

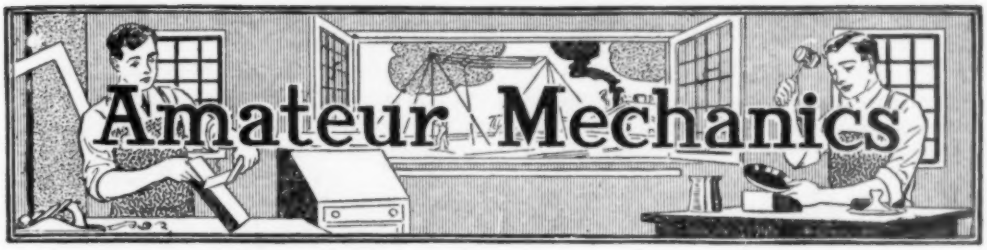
battery. If a click is heard in the receiver upon touching the sheath there is a grounded or faulty wire, and each individual wire must be tested separately against the sheath until all the faulty ones have been picked out. The connection for this test is shown in Fig. 78, at A. If a faulty wire is found make sure that the insulation is not broken at the sheath thereby causing the fault. A piece of cotton tucked under the sheath around the wires will prevent this.

In testing for "crosses," the white and colored wires are bunched separately and the battery connected, as shown in Fig. 78, at B, to one of the bunches. The wires in the other bunch are touched by the free side of the receiver cord, and if no click, other than that caused by induction, is heard, the battery is changed to the other bunch and tested. If a crossed wire is found the wires of each bunch should be separated and the battery attached to a bunch at a time and the other bunch gone through, one wire at a time, until the faulty wires are located. After having picked out and marked the crossed and grounded wire the "open" test should be made.

Connect one side of the battery to the bunch, at the far end of the section, and the other side of the battery to the sheath. At the near end of the section separate the wires and connect one side of the head phone to the sheath, and touch each wire, one at a time, with the other side of the receiver cord. Wires upon which no click is received are open and should be so marked. The method of connecting for this test is shown at C, Fig. 78.

The "pairs" in a dead cable are spliced at random, the only care necessary being to get the white wires spliced together and colored wires, of the same color, spliced together. Care must also be exercised to avoid split pairs, that is, splicing the white side of two pairs of wires together and the colored wire of one pair with the colored wire of a third pair, Fig. 79. Some companies consider it good practice to leave all faulty wires or pairs open in the splices, while others require that bad pairs be spliced to bad pairs. This point must be left to the company who is doing the work, as no rule is hard and fast concerning the practice.

(To be Continued)



A Blackboard for Children

Take a wide window shade and attach it to a roller as if hanging it to a window. Cut it to about 3 ft. in length, hem the lower edge and insert in the slot in the usual manner. Procure some black slate paint and cover the shade on one side, giving it two coats. Allow sufficient time for the first coat to dry before applying the second coat.

A blackboard of this kind is strong, and if attached to the wall with the shade fixtures, it can be rolled out of the way when not in use.—Contributed by Elizabeth Motz Rossoter, Colorado Springs, Col.

How to Make a Ski Staff

A ski staff will greatly assist progress over level stretches and is an aid to the ski runner in preserving his balance. A homemade staff that is easy to construct is shown in Fig. 1. At the upper end is a narrow leather loop for the wrist; at the extreme lower end a spike is placed for use on icy ground, and just above this spike is a disk, or stop, which, in deep snow, prevents the staff from sinking in too far and gives the necessary leverage for steering, propelling or righting oneself as needed.

The staff is made of a piece of bamboo pole, 1¼ or 1½ in. in diameter, and 4½ ft. long. The leather for the loop can be made from an old strap, shaved down thinner and cut to a width of about ½ in. The stop is a disk of wood, ½ in. thick and 5 in. in diameter. This material should be well-seasoned white pine or spruce and coated with shellac. A hole is bored through the center of the disk to let it pass upward on the staff about 6 in. Here it is fastened with two

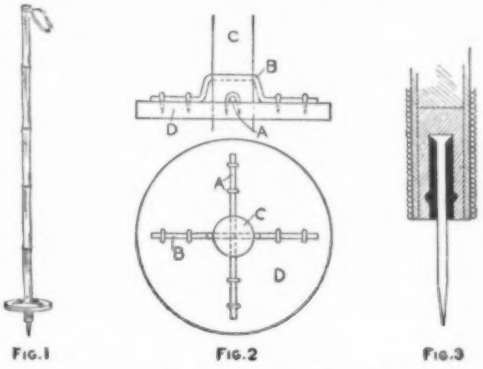


FIG. 1 FIG. 2 FIG. 3

The Staff, being Made of a Bamboo Pole, is Strong as Well as Light

pieces of heavy wire, A and B, Fig. 2. In this diagram, C is the staff, and D, the stop or disk. The wire A passes through the staff below the wire B and at right angles to it, wherefore the wire B must be bent as shown. Both wires are fastened to the stop with staples.

The lower end of the staff, as shown in Fig. 3, is plugged with hard wood, which is bored part way through its center to admit a wire spike. Slight recesses are made in the sides of this hole to anchor the lead which is poured in around the spike. The point of the latter is sharpened and then the bamboo wound with waxed twine, or fine wire, to prevent its splitting.

¶Fine emery cloth, glued to both sides of a piece of bristol board, makes a handy tool for cleaning the platinum points of a vibrator.

How to Make a Monorail Sled

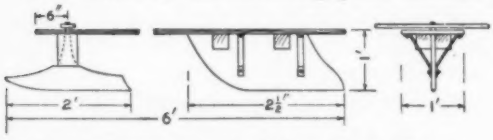
A monorail sled, having a simple tandem arrangement of the runners, is very easily constructed as follows: The runners are cut from 1-in. plank

An Exhilarating Glide Accompanied by a Buoyant Sense of Freedom Only Obtained in the Monorail Type

of the size and shape given in the sketch, and are shod with strap iron, 1 in. wide and ¼ in. thick. Round iron or half-round iron should not be used, as these are liable to skid. The square, sharp edges of the strap iron prevent this and grip the surface just as a skate.

The top is a board 6 ft. long and 1 in. thick, securely fastened to the runners as follows: Blocks are nailed, or bolted, on either side of the upper edge of the rear runner and the top is fastened to them with screws. The runner is also braced with strap iron, as shown. The same method applies to the front runner, except that only one pair of blocks are used at the center and a thin piece of wood fastened to their tops to serve as the fifth wheel.

The hole for the steering post should



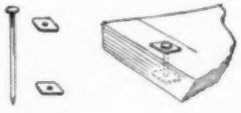
The Construction is Much More Simple Than Making a Double-Runner Bobsled

be 6 in. from the front end and a little larger in diameter than the steering post. The latter should be rounded where it passes through the hole, but square on the upper end to receive the steering bar, which must be tightly fitted in place.

In coasting, the rider lies full length on the board with his hands on the steering bar. This makes the center of gravity so low that there is no necessity for lateral steadying runners, and aside from the exhilarating glide of the ordinary sled, the rider experiences a buoyant sense of freedom and a zest peculiar to the monorail type. Then, too, the steering is effected much more easily. Instead of dragging the feet, a slight turn of the front runner with a corresponding movement of the body is sufficient to change the direction or to restore the balance. This latter is, of course, maintained quite mechanically, as everyone who rides a bicycle well knows.—Contributed by Harry Hardy, Whitby, Ont.

Binding Magazines

To bind magazines for rough service, proceed as follows: Place the magazines carefully one on top of the other in order, and space the upper one, near the back edge, for two rivets, marking off three equal distances, or, perhaps, the center space longer than the other two. Make two holes through all the magazines on the marks with an awl, or drill, then drive nails of the right length through them. Use small washers on both ends of the nails under the head and at the point, which is cut off and riveted over. This makes a good, serviceable binding for rough use.—Contributed by Carl W. Lindgreen, Los Angeles, Cal.



A Shellac Cement

As shellac is the basis of almost all cements, a good cement can be made by thickening shellac varnish with dry white lead. The two may be worked together on a piece of glass with a putty knife.

How to Make a Fire and Burglar Alarm

A very serviceable fire and burglar alarm may be installed by anyone who can work with carpenters' tools and who has an elementary knowledge of electricity. Fire and burglar alarms are divided into two general types, called "open circuit" and "closed circuit," respectively.

In the open-circuit type of alarm all the windows, doors, and places to be protected are equipped with electrical alarm springs which are in circuit with an ordinary vibrating bell and battery, and these alarm springs are all normally open. When a window or door is disturbed or moved more than a predetermined amount, the bell circuit is closed and the alarm sounded. The arrangement of such an alarm is shown in Fig. 1. A switch, A, is placed in circuit so that the alarm may be disconnected during the day and the opening and closing of doors and windows will not operate the bell. It is best not to place a switch in the fire-alarm circuit as this circuit should be in an operating condition at all times.

The alarm switch controlled by the window consists of a narrow metal plate, B, and a spring, C, mounted in a recess cut in the side of the window frame. The spring C is bent into such a form that its upper end is forced into contact with the plate B, when the window is raised past the outwardly projecting part of the spring C, and the bell circuit is thus closed. The position of the alarm switch can be adjusted so that the window may be opened a sufficient distance to permit the necessary ventilation but not allow a burglar to enter.

The alarm switch controlled by the door is arranged in a different manner. In this case the free end of the spring D is held away from contact with the spring E by the edge of the door, which forces the spring D back into the recess cut in the door jamb. When the door is opened the spring D is permitted to move out and come into contact with the spring or plate E, and the alarm circuit is thus closed. The form of the spring D can be so adjusted that the door may be opened some distance, but not enough to allow a person to enter, before the alarm is sounded.

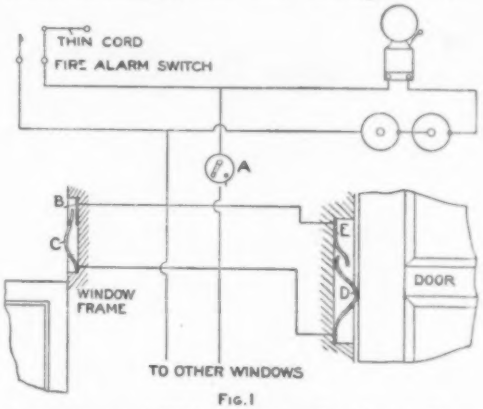


FIG. 1

Connections and Wiring Diagram Showing an Open-Circuit Fire and Burglar Alarm

An alarm switch, identical with that just described for the door, should be mounted in the upper part of the window frame to take care of the upper sash. This alarm switch may be located low enough to permit the window to be lowered for the purpose of ventilation without sounding the alarm.

The wires for these various alarm switches should be run as near completely concealed as possible to prevent them being tampered with by curious parties, who may unintentionally break one of the conductors and thus make some part of the system inoperative. It might be best to test the system occasionally, to make sure all switches are in operating condition.

The fire-alarm switch consists of two springs that are held from contact with each other by means of a thin cord. This switch is placed in the location to be protected, or wherever a fire is most likely to break out, such as over the furnace, in the coal bin, etc. When the cord is destroyed the springs make contact and the alarm is sounded. A metal having a very low melting temperature may be used instead of the cord, and the alarm will

be sounded when the temperature exceeds a certain amount and the actual occurrence of a fire thus prevented. In some cases, the fire-alarm switch may be completely destroyed and the alarm

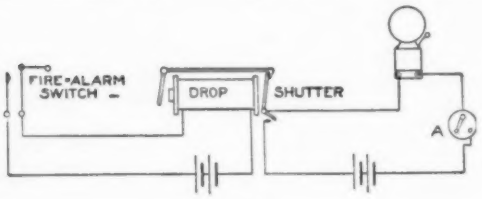


FIG. 2

Circuit Equipped with Drop to Ring the Bell in Case the Switch is Destroyed

circuit will then be opened and the bell will cease ringing. To prevent this trouble a small electric drop may be placed in the circuit, the arrangement being similar to that shown in Fig. 2. When the shutter of the drop falls, due to the closing of the alarm circuit, there is a second circuit closed, and this second circuit remains closed until the shutter is restored to its vertical or normal position, or the switch, A, is thrown to the open point. The addition of the drop in the burglar-alarm circuit may prove to be an advantage, as a burglar cannot stop the alarm, after he has once closed any of the alarm switches and operated the drop, by simply restoring the window or door to its original position.

In the closed-circuit type, the alarm

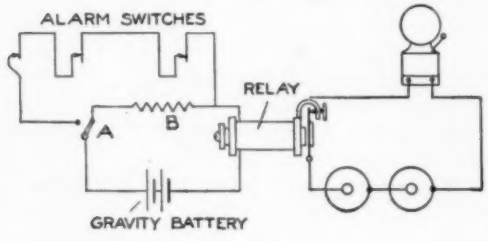


FIG. 3

Wiring Diagram Showing Connections for a Closed-Circuit Burglar and Fire Alarm

switches are all normally closed and the alarm is sounded by opening the circuit at some point. The arrangement of such an alarm is shown in Fig. 3. The alarm switches are all connected in series in this case and in circuit with a closed-circuit battery and relay or drop. The drop or relay controls a local circuit composed of an open-circuit battery and an ordinary vibrating bell.

The operation of a drop on a closed circuit is a little different from its operation on a normally open circuit. The drop for the closed circuit must be so constructed that its latch holds the shutter in a vertical position when there is a current in the drop winding, but allows it to fall as soon as the drop circuit is opened.

An ordinary telegraph relay may be used in connection with the closed-circuit alarm. The connections to the relay are such that the bell circuit is normally open and remains so until the armature of the relay is released, which does not occur until the circuit of which its winding is a part is opened at one of the alarm springs. A special switch, A, and resistance, B, are shown connected in circuit in Fig. 3, the object of which is as follows: When it is desired to disconnect the alarm springs or make them inoperative they must be replaced by another circuit which will permit a sufficient current to pass through the relay winding at all times, to prevent its armature from being released and sounding the alarm. The switch A is so constructed that either the alarm switches or the resistance B is in series with the battery and relay winding at all times, there being no open-circuit position for the switch.

The fire-alarm switch for this type of signal may be made from a narrow piece of tin foil, or some metal having a low melting temperature, mounted between two insulated clips that are connected in the alarm circuit.

Strips of gold or silver foil may be placed on windows and connected in the alarm circuit, which will give a protection from theft by breaking the glass.

Two or three gravity cells will serve very nicely for the closed-circuit battery, while several dry cells will do for the open-circuit or bell battery.

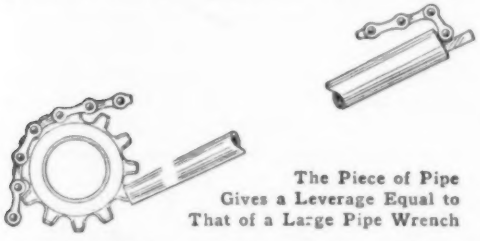
All types of alarm switches can be

purchased at any up-to-date electrical supply house, but their construction and operation is so simple that they may be easily made by almost anyone. A detailed description of the construction of the various parts of the above circuits will not be given here, but such details can be safely left to the ingenuity of the person installing the system.

It is easily seen from the above description that a burglar who might discover that a house was wired for alarm would be greatly perplexed to know what to do, for the very thing that would prevent one kind of alarm from ringing would cause the other to ring.

Removing a Rear Bicycle Sprocket

If a bicycle rider desires to remove the rear sprocket for changing the gear, or for any other reason, and there is no large pipe wrench at hand, a piece of tube or pipe, as shown in the

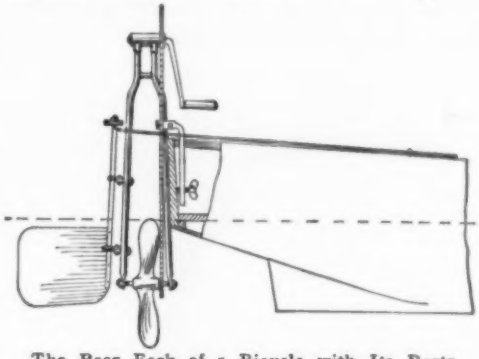


The Piece of Pipe Gives a Leverage Equal to That of a Large Pipe Wrench

sketch, can be used as a lever. Fasten one end of the chain in one end of the pipe with a wedge and place the other end of the pipe on a sprocket. The chain is then placed over the sprockets and a leverage equal to any pipe wrench is secured.—Contributed by Jno. V. Loeffler, Evansville, Ind.

Hand Propeller-Wheel Attachment for a Rowboat

The rear fork of an old bicycle frame, with the crank hanger attached, and the rear hub constitute the main parts of the propelling device. One of the cranks is cut from the hanger and a bracket attached to the frame, as shown, for making it fast to the stern of the boat. Two propeller blades are bolted to the rear hub. A rudder is fastened to the rear tube of the frame with hooks and eyes so that it can be turned with a handle at the top, or

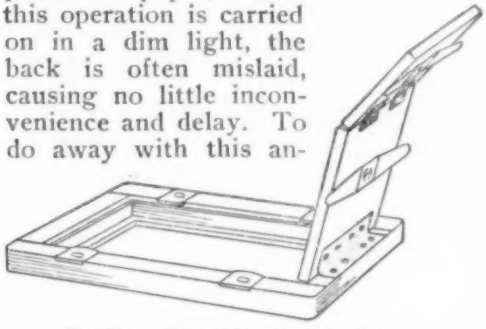


The Rear Fork of a Bicycle with Its Parts Constitutes the Main Propeller Attachment

with ropes run to a wheel. The illustration shows the connection of the device to a boat.—Contributed by Berge Lion, Fresno, Cal.

An Attached Back for a Photographic Printing Frame

In using the ordinary photographic printing frame with a spring-pressure back, the back must be entirely removed from the frame to put in the paper, and as this operation is carried on in a dim light, the back is often mislaid, causing no little inconvenience and delay. To do away with this an-

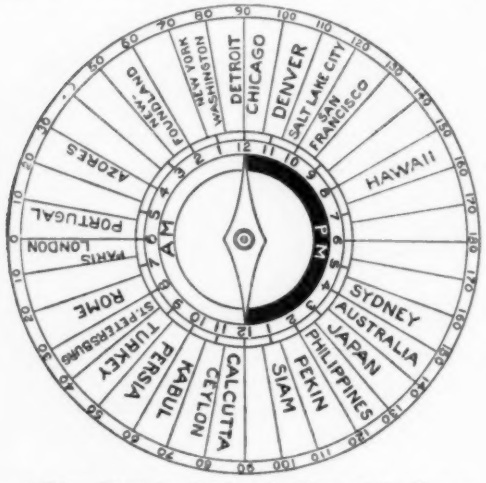


The Back, being Hinged to the Frame, Prevents It from being Mislaid

noyance, I placed at one end of the frame, as shown in the sketch, a second hinge made of cloth or any pliable material. When the pressure springs are released, the back swings down on this auxiliary hinge, and after changing the papers, it is instantly closed by a slight movement of the hand, making it very rapid and easy to use.—Contributed by Thos. L. Parker, Wibaux, Mont.

Compass Time Chart

A very instructive little instrument can be easily made for telling the time of any location on the globe. Its construction is extremely simple. Draw a circle, about 1½ in. in diameter, on a piece of paper and then draw a larger circle, about 4 in. in diameter, around the first one. Divide the circles into 36 equal parts and draw lines from one circle to the other like the spokes in a wheel. These divisions will be 10 deg., or 40 minutes of time, apart. They should be numbered around the outside, commencing at a point marked 0 and marking the numbers by tens each way until they meet at 180 deg.



A Time Chart for Telling the Hour of the Day at Any Place on the Globe

Using a map of the eastern and western hemispheres, write the names of the different cities on the globe in their respective degrees of longitude. The center, or inside, of the smaller circle is divided into 24 divisions representing the hours of the day and night, and these are marked from 1 to 12, the left side being forenoon, and the right, afternoon. The noon mark must be set on the line nearest to the location in which the instrument is to be used. For instance, if the instrument is to be used in Chicago, it is set as shown in the sketch.

The disk is mounted on a thin piece of board and a pin is driven through the center from the back side so as to make a projecting point on the upper side on which to place the magnetized needle of a compass. The needle may be taken from any cheap compass.

All that is necessary to do, to tell what time it is in any other city or country, is to turn the instrument so that the name of that place points toward the sun, when the north end of the compass needle will point on the disk to the time it is in that city or locality.—Contributed by Henry J. Marion, Pontiac, Mich.

Reversing Switch for Small Motors

A reversing switch made as follows will be found very serviceable in reversing the direction of the rotation of small motors, changing the polarity of electromagnets, etc.

A diagram of the connections to the switch and on the switch base is given in the sketch, and in this particular case the switch is shown connected to a small toy motor. The field of the motor is represented by A, the armature by B; and C, D, E, and F are four binding posts mounted on the base of the switch; G, H, and I are three contacts; J and K are terminals of the switch blades, and L a single-pole switch. The two blades of the reversing switch have their lower ends fastened to the terminals J and K, and their upper ends, which are indicated by arrow heads, may be moved over the contacts G, H, and I. For the position of the reversing switch shown by the full lines, J is connected to G and K to H. When the switch is thrown to the right-hand position, as shown by the dotted lines, J is connected to H and K to I. It is obvious that the direction of the current through the armature B will be reversed when the reversing switch is thrown from one position to the other. The direction in which the armature rotates will change, due to the reversal in direction of the current through it. The same results could be obtained by reversing the current in the field winding A. But it must always be borne in

mind that in order to reverse the direction of rotation, the current must be reversed in the armature only or in the field only, not in both.

The above switch may be constructed as follows: First, procure a piece of well-seasoned hard wood, say maple, ½ in. thick, 2½ in. wide and 4 in. long. Round off the corners and the edges of this piece on one side and drill the holes indicated in the sketch. The four corner holes should be of such a size as to accommodate the screws used in mounting four small back-connected binding posts. The remaining holes should be ⅛ in. All these holes should be countersunk with a ⅜-in. bit to a depth of ¼ in. on the under side.

Cut from some $\frac{1}{16}$-in. sheet brass two pieces, 2¾ in. long, ½ in. wide at one end and ¼ in. at the other, and round their ends. Drill a ⅛-in. hole through the larger end of each of these pieces, ¼ in. from the end, and also a hole through each, 1¼ in. from the narrow end. The last two holes should be threaded for ⅛-in. machine screws. Obtain five ⅛-in. brass bolts, ½ in. long. File the heads of three of these bolts down to a thickness of approximately $\frac{1}{16}$ in. and mount them in the holes G, H and I. Before mounting anything on the base the grooves indicated by the heavy dotted lines should be cut in the under side so that the various points may be properly connected by conductors placed in the grooves. Now mount the two pieces of sheet brass upon the base by means of the remaining two bolts, which should pass through the holes J and K. A $\frac{1}{16}$-in. washer should be placed between the pieces of brass and the wooden base.

Procure a piece of ⅛-in. fiber, 1¼ in. long and ⅜ in. broad. Drill two ⅛-in. holes in this piece, one in each end, so that they are 1 in. apart. Drill a third ⅛-in. hole in the center and fasten a small handle to the piece of fiber. Now mount this piece upon the two pieces of brass that form the blades of the switch by means of two small ⅛-in. brass machine screws.

Two small brads should be driven into the wooden base so as to prevent the possibility of the switch blades

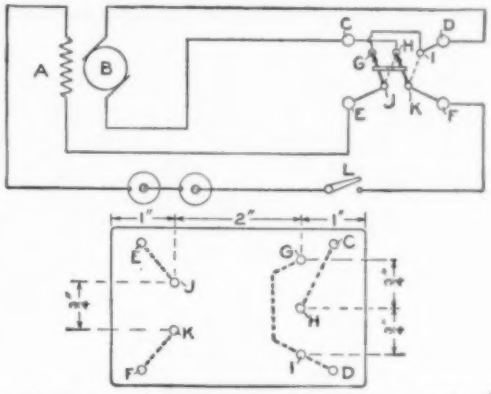


Diagram of the Wiring to a Small Motor and the Details of the Switch

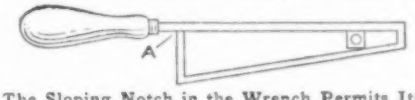
moving beyond their proper position. Two pieces of $\frac{1}{16}$-in. fiber should be placed between the heads of the screws G and H, and H and I, to prevent the ends of the switch blades from dropping down on the wooden base.

Adjustable Rod for Potted Plants

Procure a brass sash-curtain rod of the telescoping kind and stick the solid part into the soil close to the plant and tie it to the rod. As the plant grows move the tubular part of the rod upward to correspond with the height of the plant. This makes a good support and is not so unsightly as a stick.—Contributed by Gertrude M. Bender, Utica, N. Y.

Wrench for Different-Size Nuts

A very handy wrench can be made from a piece of square bar, shaped as shown and fitted with a handle. The joint at A may be halved and riveted or a weld made as desired. The size

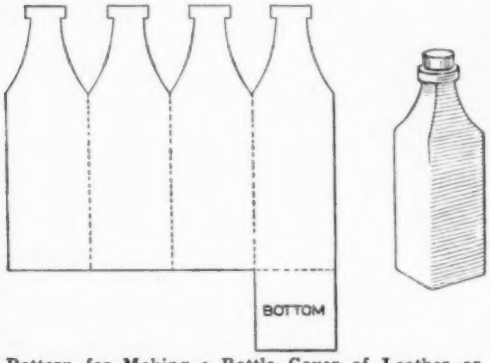


The Sloping Notch in the Wrench Permits Its Use on Nuts of Various Size

of the bar and the space between the parts will depend on the size of nuts to be turned.

A Cover for a Bottle

If a glass medicine bottle is to be carried constantly in the pocket, it is best to cover it with leather or rubber.

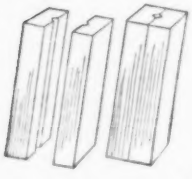


Pattern for Making a Bottle Cover of Leather or Rubber for Bottles Carried in the Pocket

The sketch shows how to cut the pattern so that it will fit a square bottle. The bottle is placed on the leather, or a piece of paper as a pattern, and the outlines marked upon it. The leather or paper is then folded over four times and cut out as shown. This cover will prevent the glass from being scattered in the pocket should the bottle be accidentally broken. It always provides a means of distinguishing it from other bottles of the same type and size. —Contributed by James M. Kane, Doylestown, Pa.

Boring a Long Hole

The usual method of boring a hole through a piece of wood longer than the bit is to bore from each end. To make the hole straight by this method, split the wood or saw it in halves, then make a knife kerf in both pieces on a center line of the hole and glue the pieces together. The spur of the bit will follow the kerf from either end, and the result will be a meeting of the holes, almost perfectly in the center. — Contributed by Ernest J. Dickert, Niagara Falls, N. Y.

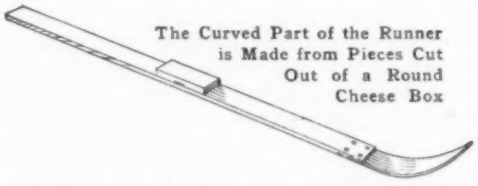


Covering for a Gas-Stove Top

While frying or cooking on a gas stove the grease will spatter over the top and make the cleaning rather difficult, especially where there are many crevices. A simple method of avoiding this trouble is to place a paper over the top of the stove, with round holes cut out for each burner a little larger than the pots and pans used in the cooking. This will keep the stove very clean with a minimum of bother. A paper cut to fit the under pan will keep that part clean.—Contributed by S. F. Warner, East Orange, N. J.

Homemade Skis

Not having a bent board suitable for a pair of skis, I proceeded to make the skis in the following manner: A cheese box was procured and two pieces cut out of the side, each 15 in. long and 3 in. wide. These were used for the upturned ends and two boards,



The Curved Part of the Runner is Made from Pieces Cut Out of a Round Cheese Box

6 ft. long and 3 in. wide, served as the runners. A notch, 4 in. long and ⅛ in. deep, was cut in one end of each board to receive one end of the thin curved pieces cut from the cheese box, which were fastened with screws. The upper end of each thin piece was cut to a point.

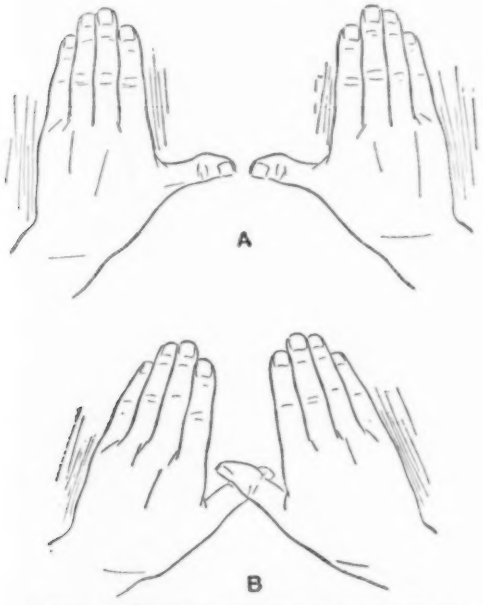
A piece for the foot, 10 in. long and 3 in. wide, with a notch 1 in. wide and ¼ in. deep, was fastened in the center of the runner. A strap is run through the notch for holding the ski to the foot.—Contributed by Henry Meuse, Reading, Mass.

¶To remove iron rust or ink stains from cloth, use a warm solution of oxalic acid with a few crystals of citric acid added. Repeat the washings until the stain is removed.

Tricks Performed with Thumbs Tied Together

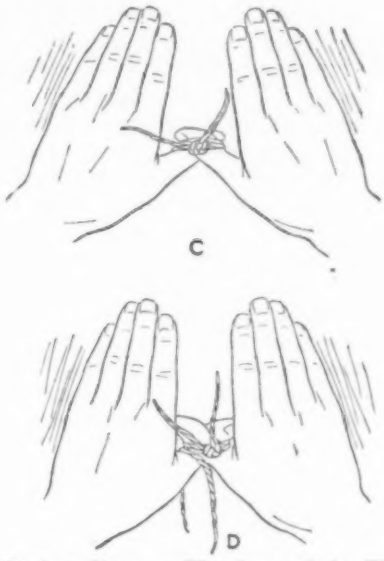
To have one's thumbs securely tied together by any person in an audience and examined by the spectators, then have some one throw a hoop or bicycle rim on one of the performer's arms as if the thumbs were not tied, seems impossible, yet this trick can be done, and its simplicity is its own protection, even though performed close to a committee selected from the audience. A stick can be held perpendicularly by anyone with one hand at each end and the performer can thrust his arms at the stick which passes between them with the thumbs apparently tied tightly together. The same effect is produced on the arm of any person, while the hands are tightly clasped, and before and after each movement the tied thumbs are examined by the committee.

The two cords used for the trick are made as follows: The first should be about 17 in. long, ¼ in. in diameter



Manner of Crossing the Thumbs to Receive the Double Tie of the Cord

at its center and tapering to points at the ends. The other cord is about 13 in. long, ⅛ in. in diameter in the center and also tapering at the ends. They are constructed of Chinese or Japanese paper, which is a soft, but very tough,



The Cords as They are Placed around the Thumbs and Tied in a Double Knot

fibrous texture. Cut the paper into strips, 1 in. wide, taking care that the grain, or rather the fiber, runs lengthwise. Beginning at one end, twist the paper on itself at an angle as in rolling the old-fashioned paper lamp lighter. Each turn should lap over the former about half of its width. When within 3 in. of the end of the first strip apply another by moistening the joining ends and continue the twisting. When the length given is reached, break off the strip and start back over the first in the opposite direction. Lay on enough layers to secure the diameter given. When finished, the cords should be strong enough to resist the pressure applied by the hands.

With all fingers pressed together spread both thumbs away from the hands, as shown at A. Lay the right thumb across the left, as at B, the large knuckle bone of one lying directly over that of the other. The largest cord is laid over the crossing and both ends brought down, crossed under the

thumbs, then up again, and tied in two knots on top of the right thumb, as at C. The trick in the tying is at this point. Just as the tie is being made pull the left thumb until the smallest-diameter joints reach the cord and pull down with the left hand. Push the right thumb so that the fleshy part enters as far as possible into the cords. Insist on the tie being made tightly.

The second and smaller cord is laid below the right thumb as shown at D, and on top of the left against the first cord, crossed, brought back and tied twice. When this is being done reverse the pushing and pulling as described, pushing the left thumb and pulling out on the right. Secure all the slack on the left thumb, the right being pushed into the cords at its smallest diameter and the second cord being tied high up and as near the right thumb as possible, with knots tightly drawn. If this second knot is not tight it will give trouble in performing the trick.

The release is made by bringing the tips of the fingers together and placing the thumbs into the palms. If the ties have been carefully made there will be no trouble to withdraw the left thumb as it is masked by the hands. The peculiar nature of the paper cord causes the loop from which the thumb was removed to remain open and rigid as a wire loop, and if the last tie was tightly drawn, the second cord will not slip down to close the loop. In approaching the hoop, stick, or arm, touch the thing to be passed with the finger tips and withdraw them, swaying backward a few times and, in the last swing before making the pass, remove the thumb from the loop. After passing, replace the thumb in the loop. In passing the object, open the finger tips, then close them and open the palms, and push the left thumb back into the loop, close the palms and apply a strain on both thumbs, then show the tie. Be careful to press both thumbs closely into the palms in passing so that they will not strike the object.

Always exhibit the tie from the back of the hands with the palms spread out. If there is any difficulty in drawing out or replacing the thumb in the loop, it is because the ties have not been properly made or tied when the thumbs were in the right place. It requires some practice to do the trick quickly.—Fayette.

A Way to Keep Home Accounts

An easy way to keep track of all the home expenses is by the popular card system. The index cards can be had at any stationery-supply house. Place the cards in a box on end and have a good supply of blanks back of them ready for use. Under, or back of, each letter place as many blanks as is necessary, and almost instantly any item of expense in the home may be found, such as the cost of coal for the year, drugs, meat, the cost of clothing for a child, and the account of the head of the family. The boy's account might read as follows under the letter J:

Johnnie

Jan. 3	Shoes	$3.50
Jan. 15	Book	.45
Jan. 29	Hair cut	.25
Feb. 1	Stockings	.75

and so on through the year. The mother can see at a glance just when the last shoes were bought, and how much it cost for books and paper.

Everything pertaining to the home keeping can be so recorded and each year compared. Once given a trial no other bookkeeping will be required in the home where time counts. Children can be taught to keep account of their expenses in this way, and thus thrift and good business methods are encouraged.—Contributed by Harriette I. Lockwood, Philadelphia, Pa.

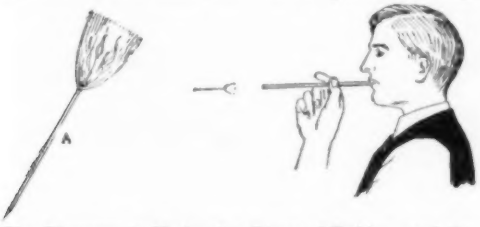
How to Make a Blowgun

Either a 12-in. length of a small curtain-rod tubing or a straight piece of small bamboo pole, cut off between the joints, can be used for the gun part of this simple device. If bamboo is used, see that it is cleaned out smoothly on the inside.

The dart used in the gun is shown

at A in the illustration. It is made by threading the eye of a darning needle full of yarn, clipping all the strands off to a uniform length of about ¾ in., and then picking out the fibers into a brushlike mass above the needle's eye. Another needle or pin can be used for fuzzing the threads. The point to observe is that the brush is of somewhat larger diameter than the bore of the gun, so that when the needle is pushed into the mouth end the brush will be compressed and make an air-tight plug.

After thus inserting the dart, hold it as shown and give a quick, sharp blast of the breath into the gun. The dart will travel with great speed and accuracy for 20 ft. or more, and stick wherever it strikes. The point being



The Blowgun is Made of a Piece of Tubing, and the Dart of a Darning Needle

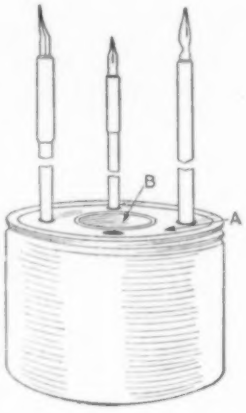
so small, it can be used in the house for shooting at a paper target pinned to the wall without injury to the plaster or woodwork.—Contributed by C. C. Fraser, Saginaw, Mich.

A Brush for Applying Soldering Acid

A good brush for applying acid to articles for soldering can be made of a piece of small copper pipe for the handle, and fine copper wire for the brush. To make the brush part, take a piece of cardboard, about 1¼ in. wide, and wind several turns of No. 28 gauge copper wire around it, then remove the coil, insert about ½ in. of it in the pipe, and flatten the latter to hold the wire. Clip the ends of the wire, and a brush will be had that ordinary acids will not affect. If only a short piece of pipe is available, it can be used as a ferrule and a handle made of wire or wood.—Contributed by A. R. Cunning, W. New Brighton, N. Y.

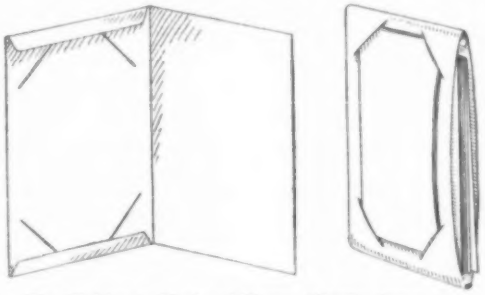
Inkwell and Penholder

An empty paste pot with a water well in the center makes an excellent inkwell and penholder. Fill the exterior well A with cement or plaster of paris, push the number of penholders to be held into the cement before it sets, moving them about occasionally to prevent the cement from sticking to them and to make the hole a little larger than the holder. The part B is for the ink.—Contributed by R. F. Pinkney, Lazareto del Mariel, Cuba.



A Homemade Loose-Leaf Pocket Memorandum

The little memorandum illustrated herewith is very handy to carry in the coat or vest pocket for taking notes, etc. Loose leaves may be supplied with very little trouble. It consists of a fold of paper, cut as shown and pasted at the ends. The pocket thus formed will easily hold 2 doz.



The Holder is Made of Heavy Manila Paper and will Stand Considerable Wear

sheets and the slits cut on the outside will admit 8 sheets.—Contributed by C. B. Hanson, Fitchburg, Mass.

¶An ideal cleaner for kid gloves is carbon tetrachloride.

INTERESTING NEW PATENTS

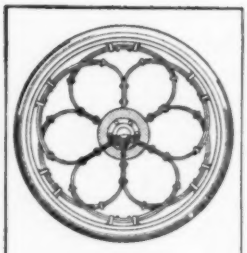


FIG. 1

SPRING WHEEL FOR AUTOMOBILES (Fig. 1)—Many attempts have been made to devise a satisfactory spring wheel for automobiles, and of the various inventions of this sort one of the simplest is that shown in the figure. The spring feature consists of a series of steel loops with the adjacent "spokes" or radial parts riveted together as shown. These loops fit into recesses in the hub and have their outer curves secured by steel bands to the inner side of the rim.

WINDMILL WITH HORIZONTAL WHEEL (Fig. 2)—In this novel windmill the vanes are mounted on a vertical axis so that they swing horizontally under the action of the wind, each vane being pivoted to the upper and lower rims of the wheel. By means of a spring-operated dog which alternately engages and releases the vane, each vane swings out at a right angle to the rim when traveling with the wind, but swings into such a position as to offer no resistance when traveling against the wind.

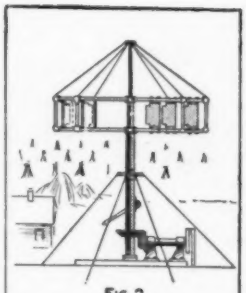


FIG. 2

COLLAR BUTTONER (Fig. 3)—This simple device is intended to do away with the irritating work of buttoning a collar which is a trifle too tight, or which, for any other reason, is hard to button. The ring is simply placed over the button, as shown, and the pointed end is inserted through the buttonhole. The collar is then slipped over the button and behind the ring of the buttoner.

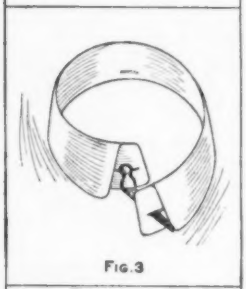


FIG. 3

NOVEL TYPE OF LIFE PRESERVER (Fig. 4; British patent)—This life preserver is so made that the wearer remains upright in the water and is only submerged to the waist. It is worn much like a suit of clothes. Buoyancy is supplied around the waist only by means of air spaces which are inflated through tubes.

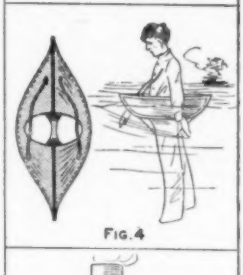


FIG. 4

HEADLIGHT ADJUSTS ITSELF TO CURVED TRACK (Fig. 5)—A fixed headlight on a locomotive throws its light to one side of the track when the locomotive is rounding a curve, and to overcome this and to bring about an illumination of the track under all conditions the "dirigible" headlight has been invented. This headlight is pivoted to swing from side to side and is controlled by a lever connected with the front end of the truck and pivoted on the side of the boiler.

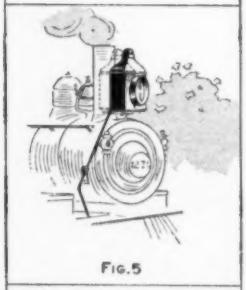


FIG. 5

GEAR FOR RAISING AND LOWERING LIFEBOATS (Fig. 6; British patent)—The boats are supported on rollers that move on overhead runways, and by this means one boat is easily brought into position while the boat ahead of it is being lowered by the pivoted davits.

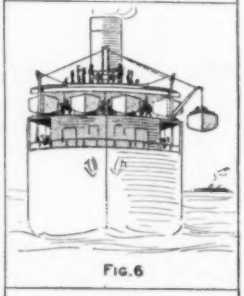


FIG. 6

APPARATUS LOCATES DIRECTION OF SOUND (Fig. 7; British patent to a German)—For locating the direction of a foghorn or other sound-producing object with reference to a ship, microphones, arranged in circuit with a recording instrument, are placed along the side of the ship at equal intervals, as shown, and the direction of the sound is determined by the order in which these microphones are affected.

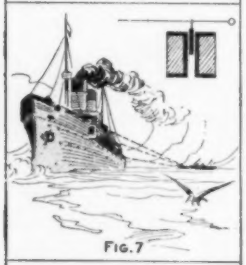


FIG. 7

PIPE-CLOSING DEVICE (Fig. 8)—This device consists of two approximately semicircular pieces, each cut in the form of a wedge and provided with teeth so that the pieces interlock. In use, the lower piece is held in place in the pipe and the upper piece is driven to a firm bearing.

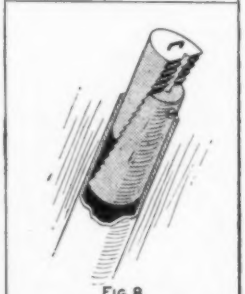


FIG. 8

BALL SLINGER (Fig. 9)—This device is designed to be used after the manner of the old-style sling. The ball is inserted in the opening at the end, and by means of the setscrew near the bottom of the slot a pressure just sufficient for holding it in place, but permitting its release at the end of the stroke, is secured.

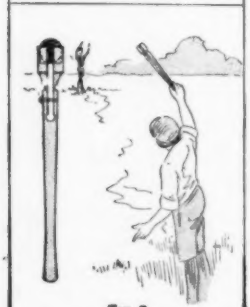


FIG. 9

APPARATUS FOR FITTING BUTTON SHOES (Fig. 10; U. S. patent to a Frenchman)—In using this device elastic cords, attached to the bracket at the rear of the foot rest, are fastened by hooks to the buttonholes. This draws the overlapping part of the shoe into position.

FIG. 10

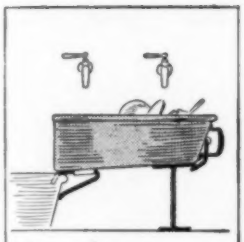


FIG. 11

PAN FOR DRAINING DISHES (Fig. 11)—This pan is designed to be set up in a sink or on a table in such a way that the dishes will drain into the dish pan, to which the device is readily attached. The open end has a wire clip which fits over the edge of the dish pan.

MACHINE FOR UTILIZING WAVE POWER (Fig. 12)—A float carried on the end of a frame, which is pivoted at the other end to a rigid structure, is connected to the piston rod of a pump. The pump is operated by the raising and lowering of the float.

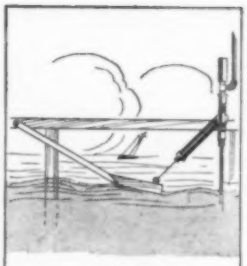


FIG. 12

GLOVE HEATED BY ELECTRICITY (Fig. 13; U. S. patent to a Frenchman)—In this glove the fingers are kept warm in the coldest weather by small electrical conductors which serve as heating bodies, and which are distributed around the lining of the finger stalls.

FIG. 13

HOLDER FOR SHAVING SOAP (Fig. 14)—This device, designed for convenience in shaving, provides a handle, which is easily attached to a cylindrical cake of soap. The cap or pan into which the soap fits is provided with a pair of perforations on one side. The handle consists of a loop of wire, and the sharp ends of the wire are inserted through the perforations and into the soap.

FIG. 14

HATPIN WITH SAFETY POINT (Fig. 15; U. S. patent to a Scotchman)—The body of this hatpin consists of a tube, in one end of which is a sliding wire tipped with a sharp point. The wire is made as a spring, and when drawn out, takes the position shown, with the point folded back against the tubular portion. When the hatpin is to be removed, the wire is easily straightened with the fingers.

FIG. 15

TELEPHONE OUTFIT FOR THE DEAF (Fig. 16)—This telephone outfit, when not in use, has the appearance of an ordinary hand bag. In one of the pockets is a battery and telephone transmitter, the latter having its receiving face attached to the perforated wall of the bag so that sounds will be received through the perforations.

FIG. 16

COMBINED BED AND CABINET (Fig. 17)—In city apartments, where adequate closet room is often lacking, a bed like this, in which the head is made in the form of a cabinet, should prove a great convenience. The cabinet portion has two compartments, the lower being reached through a side door, and the upper through an opening at the top, which is closed by a lid operating on sliding standards, as shown.

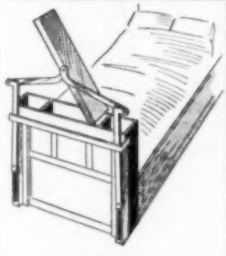


FIG. 17

FLYING MACHINE WITH FLAPPING WINGS (Fig. 18; U. S. patent to a German)—This arrangement of planes for a flying machine is one of the most novel that has been proposed. Attached to a journal at each side of the main frame is a gliding plane which may be turned to take the air currents at any angle. The flapping wing, which is operated by the motor, is carried on a shaft that runs diagonally across the gliding plane and is provided with hinged panels which are closed on the downward stroke and open on the upward stroke of the plane.

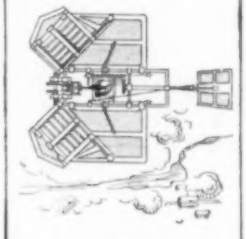


FIG. 18

DIVING APPARATUS (Fig. 19)—This elaborate diving apparatus is designed mainly for sponge fishing. It has three bay windows provided with glass-covered portholes through which the bottom of the sea may be examined, and a water-tight chamber, shown at the front, through which the diver leaves and enters the main casing. By means of a rubber hand-and-arm casing projecting downward from each bay window, sponges may be gathered and placed in a small receptacle below the main floor while the diver remains within the casing. This apparatus is tilted from side to side by the occupant by means of weights movable on a circular track.

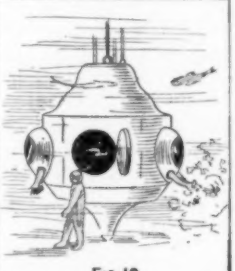


FIG. 19

STRAPS FOR ADJUSTING LENGTH OF SKIRT (Fig. 20; British patent)—These straps, or tabs, are designed to permit the skirt to be worn shortened when desired, without any alteration in the garment. The tops of the straps are permanently fastened to the garment, which is shortened by hooking the lower ends of the straps over buttons.

FIG. 20

COTTAGE WITH GOOD ARRANGEMENT OF ROOMS

W. W. Abell & Son, Architects, Elgin, Ill.

First-Floor Plan at Left; Second-Floor Plan at Right

One of the most attractive features of this six-room cottage is the convenient arrangement of the rooms and the economical and effective division of the floor space. The plan follows the old-fashioned idea of placing a hall through the center of the building with a stairway at the end leading up to the second floor. The living room is unusually large, occupying all the space at one side of the central hall, while the dining room is placed at the front of the house and is provided with good light and a cheerful outlook. A particular point to be noted is the way in which the kitchen, while easy of access, is separated from the remainder of the house. This room opens directly into the dining room, and both may be entirely separated from the hall and living room by means of sliding doors. The hall on the second floor gives ready access to all the rooms without any unnecessary sacrifice of space. The lower story is of shingles stained a dark brown, while the upper story has a surface of white cement plaster divided into three horizontal sections by dark-brown wooden strips. The cost of this cottage complete was $3,300.